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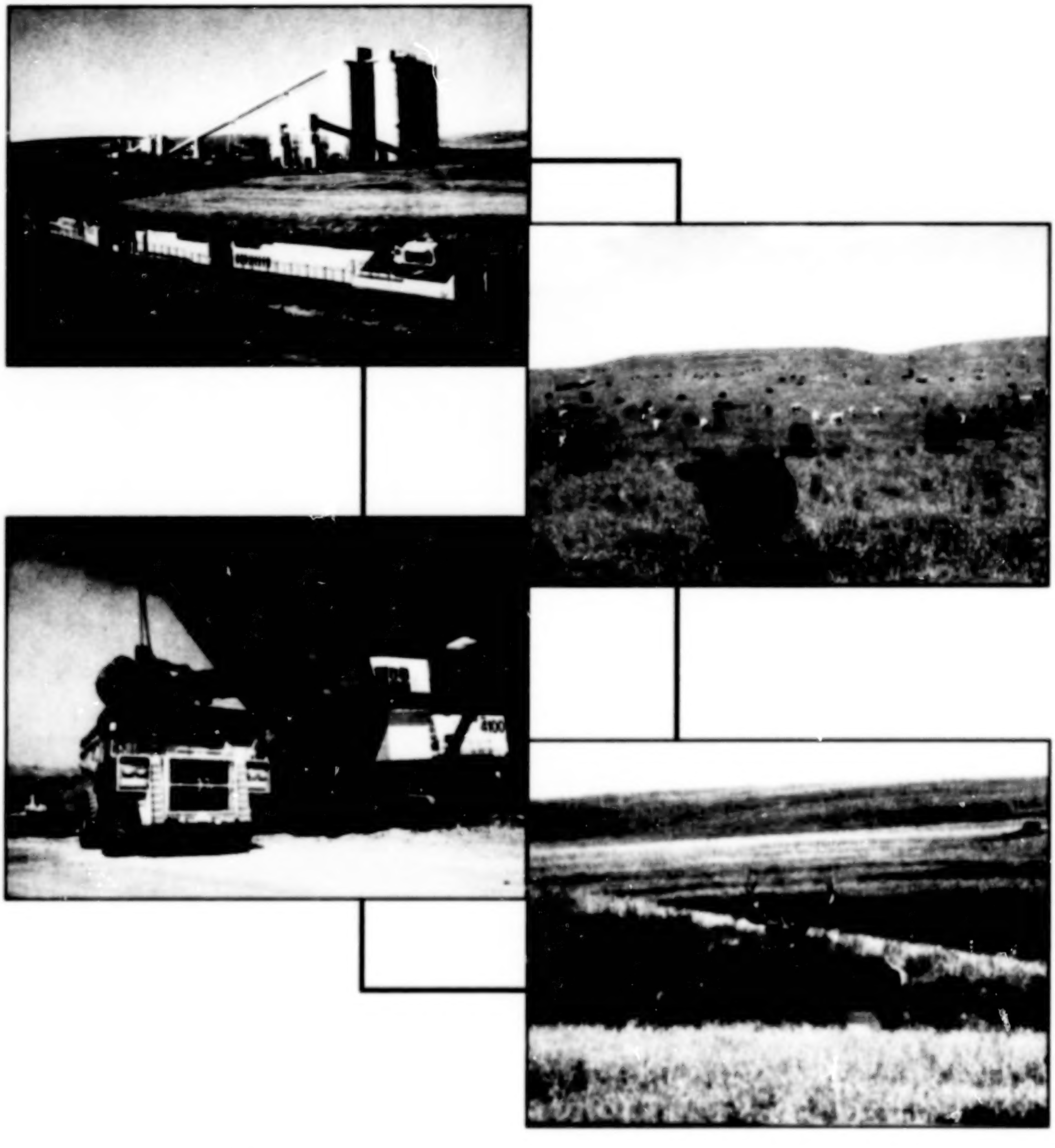
U.S. Department of the Interior
Bureau of Land Management
Wyoming State Office

Casper Field Office
November 2000

DRAFT
Environmental Impact Statement for the North Jacobs Ranch Coal Lease Application (WYW 146744)



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MISSION STATEMENT

It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

BLM/WY/PL-01/001+1320

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
Wyoming State Office
P.O. Box 1828
Cheyenne, Wyoming 82003-1828

In Reply Refer To:

3425 (930)
WYW146744
N. Jacobs Ranch

November 8, 2000

Dear Reader:

This copy of the Draft Environmental Impact Statement (DEIS) for the North Jacobs Ranch Coal Lease Application, Bureau of Land Management (BLM) Serial Number WYW146744, is provided for your review and comments. This DEIS has been prepared to analyze the potential environmental and socioeconomic impacts of issuing a Federal coal lease for the North Jacobs Ranch coal tract located adjacent to the Jacobs Ranch surface coal mine in southeastern Campbell County, Wyoming.

A formal public hearing on the proposed North Jacobs Ranch coal lease application will be held at 7 p.m. on January 17, 2001, at the Clarion Western Plaza Hotel (formerly the Holiday Inn), 2009 S. Douglas Highway, Gillette, Wyoming. The purpose of the hearing is to receive comments on the proposed coal lease sale, on the fair market value, and maximum economic recovery of the Federal coal resources in the proposed North Jacobs Ranch tract, and on the DEIS. Prior to the formal hearing, there will be an open house at 6:30 p.m. at the above address to answer questions related to the coal lease-by-application process and this coal lease application.

BLM will accept comments on this DEIS, as well as on the issues of fair market value of the tracts, and maximum economic recovery of coal in the tracts, for sixty (60) days commencing on the date the Environmental Protection Agency (EPA) publishes its Notice of Availability in the Federal Register. We expect EPA will publish that notice on December 15, 2000. Comments received after the end of the 60-day comment period will be considered in the Final EIS if time permits.

If you wish to comment on the DEIS, we request that you make your comments as specific as possible. Comments will be more helpful if they include suggested changes, sources, or methodologies. Opinions or preferences will not receive a formal response. However, they will be considered and included as part of the BLM decision making process.

This DEIS was prepared pursuant to the National Environmental Policy Act and applicable regulations, and other applicable statutes, to address possible environmental and socioeconomic impacts that could result from this project. This DEIS is not a decision document. Its purpose is to inform the public of the impacts of leasing and mining the Federal coal proposed for lease in a maintenance coal lease application, and to evaluate alternatives to leasing and mining the proposed maintenance coal lease application.

Comments, including names and street addresses of respondents, will be available for public review at the address listed below during regular business hours (7:45 a.m.- 4:30 p.m.), Monday through Friday, except holidays, and will be published as part of the Final EIS. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

Please send written comments to Bureau of Land Management, Casper Field Office, Attn: Nancy Doelger, 2987 Prospector Drive, Casper, WY 82604. Written comments may also be e-mailed to the attention of Nancy Doelger at "casper_wymail@blm.gov." E-mail comments must include the name and mailing address of the commentor to receive consideration. Written comments may also be faxed to (307) 261-7587.

If you have any questions or would like to obtain additional copies of this DEIS, please contact Nancy Doelger at (307) 261-7627, or at the above address.

Sincerely,

Alan R. Pierson

Alan R. Pierson
State Director

NORTH JACOBS RANCH COAL LEASE APPLICATION (WYW141435)
ENVIRONMENTAL IMPACT STATEMENT
ABSTRACT

[x] Draft [ ] Final

Lead Agency:
U.S. Department of the Interior
Bureau of Land Management

Cooperating Agency:
U.S. Department of the Interior
Office of Surface Mining Reclamation and Enforcement

Counties That Could Be Directly Affected:
Campbell County, Wyoming

Abstract:

This Draft Environment Impact Statement (EIS) assesses the environmental consequences of a federal decision to hold a competitive, sealed-bid sale and issue a lease for a federal coal tract located in southeastern Campbell County, Wyoming, subject to standard and special lease stipulations. The North Jacobs Ranch Lease By Application (LBA) Tract as applied for by Jacobs Ranch Coal Company includes approximately 4,821 acres containing approximately 519 million tons of mineable federal coal. Jacobs Ranch Coal Company operates the adjacent Jacobs Ranch Mine and proposes to mine the North Jacobs Ranch LBA Tract as a maintenance tract for the existing mine, if a lease sale is held and they acquire the lease. This Draft EIS describes the physical, biological, cultural, historic, and socioeconomic resources in and surrounding the project area. The focus for the impact analysis was based upon resource issues and concerns identified during previous coal leasing analyses and public scoping conducted for this lease application. Potential concerns related to development include impacts to groundwater, air quality, and wildlife and cumulative impacts related to ongoing surface coal mining and other proposed development in the Powder River Basin of Wyoming.

Other Environmental Review or Consultation Requirements:
This draft EIS, in compliance with Section 7(c) of the Endangered Species Act (as amended), identifies any endangered or threatened species which are likely to be affected by the Proposed Action.

Lead Agency Contact:
For further information contact Nancy Doelger at:

Bureau of Land Management, Casper Field Office
2987 Prospector Drive
Casper, WY 82604
(307) 261-7627
E-mail comments may be sent to the attention of Nancy Doelger at
casper_wymail@blm.gov

DRAFT

ENVIRONMENTAL IMPACT STATEMENT FOR THE NORTH JACOBS RANCH COAL LEASE APPLICATION (FEDERAL COAL LEASE APPLICATION WYW146744)

Prepared for

U.S. Department of the Interior
Bureau of Land Management
Casper Field Office
Casper, Wyoming

and

Cooperating Agency

U.S. Office of Surface Mining
Reclamation and Enforcement
Denver, Colorado

by

WWC Engineering
Sheridan, Wyoming

NOVEMBER 2000

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EXECUTIVE SUMMARY

On October 2, 1998, JRCC[1] filed an application with the BLM for a maintenance coal lease for federal coal reserves located north and west of JRCC's existing Jacobs Ranch Mine (Figures ES-1 and ES-2). This coal lease application, which is referred to as the North Jacobs Ranch LBA Tract, was assigned case file number WYW146744. As applied for, this tract includes approximately 4,821 acres and approximately 519 million tons of in- place federal coal. The lands applied for in this application are located in southeastern Campbell County, Wyoming, approximately 7 miles east of Wright, Wyoming.

This lease application was reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization, and it was determined that the application and the lands involved met the requirements of the regulations governing coal leasing on application at Title 43 of the Code of Federal Regulations Part 3425.1 (43 CFR 3425.1). The application was also reviewed by the PRRCT at public meetings held on February 23, 1999, in Billings, Montana, and on October 27, 1999, in Gillette, Wyoming. At that time, the PRRCT recommended that the BLM process the lease application as an LBA, pending resolution of the conflicts between proposed coal mining and existing and proposed oil and gas development, including CBM on the tract. In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing and mining the federal coal.

To evaluate the environmental impacts of leasing and mining the coal, the BLM must prepare an EA or an EIS to evaluate the site-specific and cumulative environmental and socioeconomic impacts of leasing and developing the federal coal in the application area. The BLM made a decision to prepare an EIS for this lease application.

BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for the federal coal tract and issue a federal coal lease. If a sale is held, the bidding at that sale would be open to any qualified bidder; it would not be limited to the applicant. If a lease sale is held, a federal coal lease would be issued to the highest bidder at the sale if a federal sale panel determined that the high bid at that sale meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation, and if the U.S. Department of Justice determines that there are no antitrust violations if a lease is issued to the high bidder at the sale. JRCC previously applied for federal coal under the LBA process, was the successful high bidder when a competitive lease sale

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

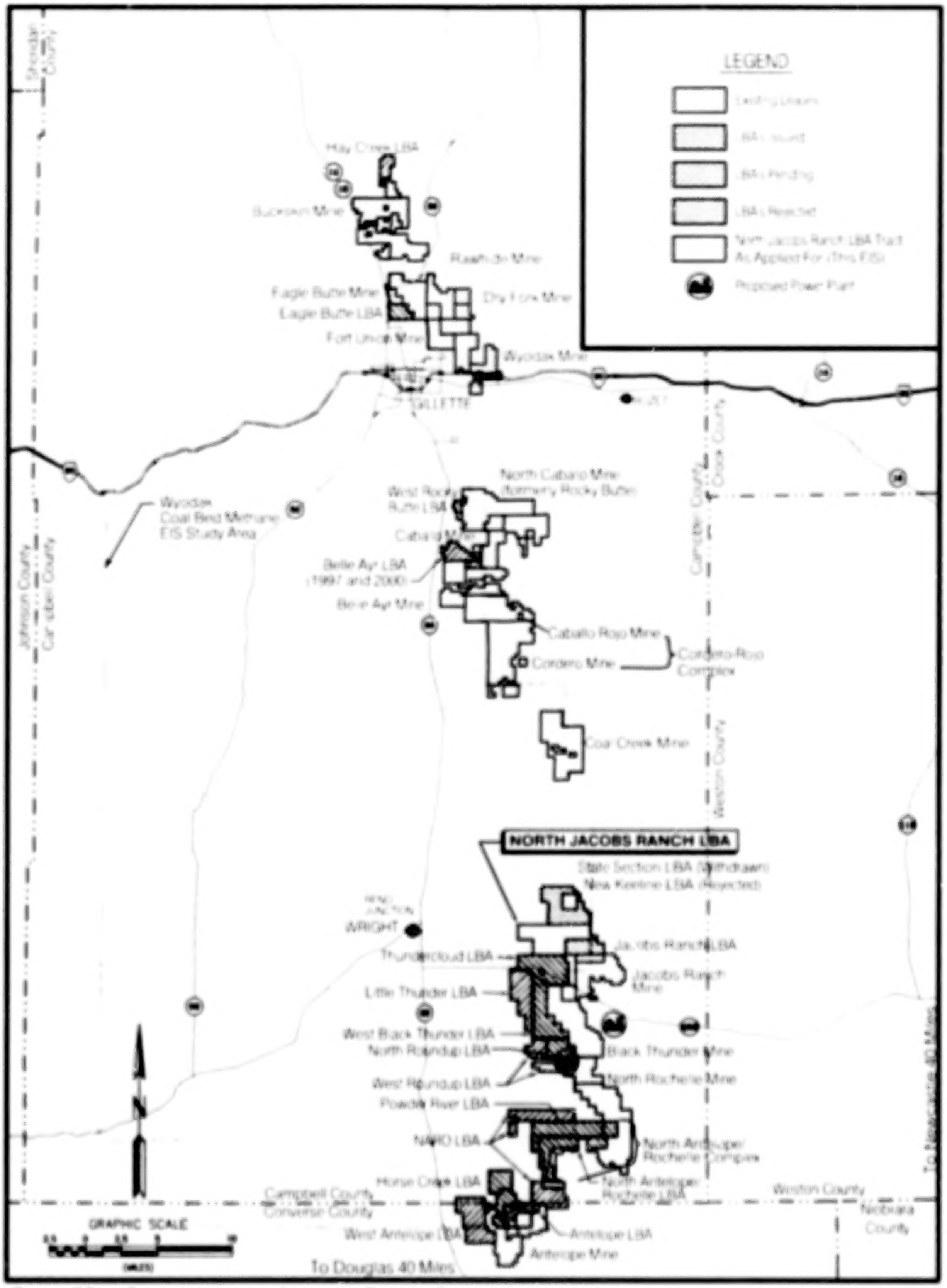

Figure ES-1. General Location Map with Federal Coal Leases and LBAs

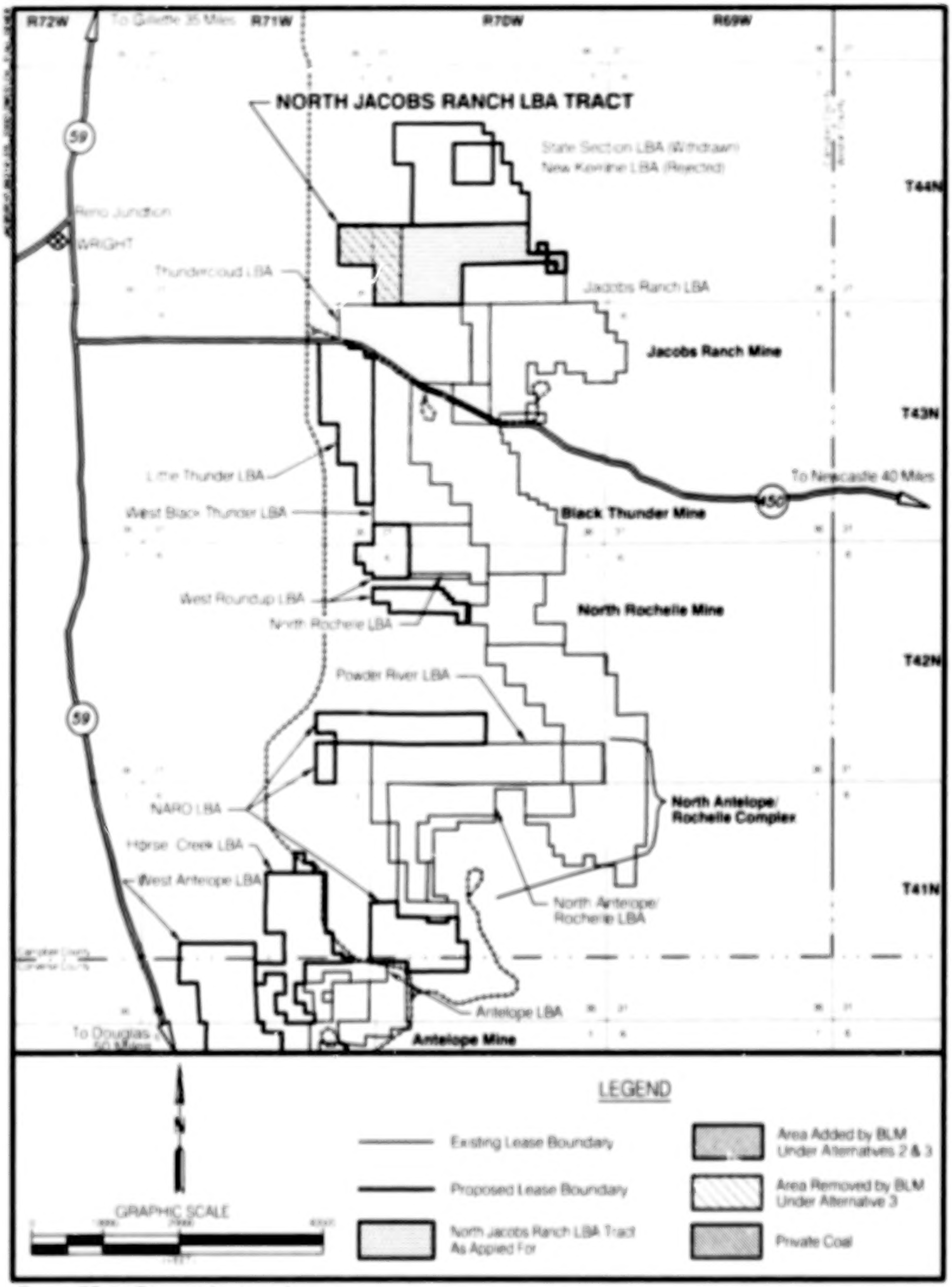

Figure ES-2 General Analysis Area

was held, and, in 1991, was issued a maintenance lease adjacent to this same mine.

Other agencies, including OSM, a cooperating agency on this EIS, will also use this analysis to make decisions related to leasing and mining the federal coal in this tract. The USFS is not a cooperating agency on this EIS because there are no federal surface lands managed by the USFS included in the North Jacobs Ranch LBA Tract.

The lands in the North Jacobs Ranch LBA Tract have been subjected to four coal planning screens and determined acceptable for consideration for leasing. A decision to lease the federal coal lands in this application would be in conformance with the BLM Resource Management Plan for the Buffalo Field Office.

The North Jacobs Ranch LBA Tract is contiguous with both the Jacobs Ranch Mine and the Black Thunder Mine, owned by Ark Land Co.

The LBA sale process is, by law and regulation, an open, public, competitive sealed-bid process. If a lease sale is held for this LBA tract, the applicant (JRCC) may not be the successful high bidder. The analysis in this EIS assumes that JRCC would be the successful bidder on the North Jacobs Ranch LBA Tract if a sale is held, and that it would be mined as a maintenance tract for the Jacobs Ranch Mine.

This draft EIS analyzes four alternatives:

The Proposed Action is to hold a competitive coal lease sale and issue a maintenance lease to the successful bidder for the North Jacobs Ranch LBA Tract as applied for (Figure ES-2). Under this alternative, JRCC projects that average annual coal production would increase by 9 millions tons to 39 mmtpy and employment would increase by 18 to 368 persons.

Alternative 1 is the No Action Alternative. Under this alternative, the LBA Tract would not be leased, but the existing leases at the adjacent Jacobs Ranch Mine and Black Thunder Mine would be developed according to the existing approved mining plans. Under this alternative, JRCC projects that average annual production would be 30 mmtpy and average employment would remain at 350 persons. JRCC estimates that they have approximately 6.7 remaining years of leased coal reserves at an average annual production rate of 30 mmtpy.

Alternative 2 considers holding a competitive coal lease sale and issuing a maintenance lease to the successful bidder for the North Jacobs Ranch LBA Tract as reconfigured by BLM (Figure ES-2). BLM developed an amended tract configuration in order to avoid a potential future bypass situation. Under this alternative, approximately 161 acres containing about 4 million tons of unleased federal coal east of the North Jacobs Ranch LBA Tract as applied for would be added to the tract. Production and employment would be similar to the Proposed Action.

Alternative 3 also considers holding a competitive coal lease sale and issuing a maintenance lease to the successful bidder for a reconfigured North Jacobs Ranch LBA Tract (Figure ES-2). BLM would remove approximately 1,620 acres from the western part of the North Jacobs Ranch LBA Tract in order to reduce conflicts with existing and proposed oil and gas development and would add about 161 acres east of the tract to avoid a future bypass situation. Under this alternative, the tract would include approximately 3,364 acres and 317 million tons of mineable coal. Production and employment would be similar to the Proposed Action.

Table ES-1 summarizes coal production, surface disturbance, and mine life for the Jacobs Ranch Mine under each alternative. The environmental impacts of mining the LBA tract would be similar under the Proposed Action and Alternatives 2 and 3.

Other alternatives that were considered but not analyzed in detail include holding a competitive coal lease sale and issuing a lease to the successful bidder (not the applicant) for the purpose of developing a new stand-alone mine, expanding the tract to include additional lands applied for as part of the State Section LBA Tract application, and delaying the competitive sale of the LBA Tract. The State Section LBA Tract application has been withdrawn by the applicant.

Critical elements of the human environment (BLM 1988) that could be affected by the proposed project include air quality, cultural resources, Native American religious concerns, threatened, endangered (T&E), and candidate plant and animal species, hazardous or solid wastes, water quality, wetlands/riparian zones, environmental justice, and invasive nonnative species. Five critical elements (areas of critical environmental concern, prime and unique farmland, wild and scenic rivers, floodplains, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, the EIS discusses the status and potential effects of the project on topography and physiography, geology and mineral resources, soils, water availability and quality, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

The project area is located in the PRB, a part of the Northern Great Plains that includes most of northeastern Wyoming. The North Jacobs Ranch LBA Tract is located in the south-central part of the PRB. The elevation ranges from about 4,500 to 4,800 ft in an area of dissected uplands. In the LBA Tract, there are three mineable coal seams, referred to as the Upper, Middle, and Lower Wyodak coal seams. The Upper Wyodak coal seam averages 12.5 feet in thickness on the LBA Tract, the Middle Wyodak coal seam

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Table ES-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for North Jacobs Ranch LBA Tract and Jacobs Ranch Mine

Item	**No Action Alternative (Existing Jacobs Ranch Mine)**	**Added by Proposed Action**	**Added by Alternative 2**	**Added by Alternative 3**
Mineable Coal (as of 1/1/00)	225.9 mmt	519 mmt	523 mmt	317 mmt
Recoverable Coal (as of 1/1/00)	203.3 mmt	467.1 mmt[1]	471 mmt	285.3 mmt[1]
Coal Mined Through 1999	349.9 mmt	—	—	—
Lease Acres[2]	6,955 ac	4,821.19 ac	4,982.24 ac	3,363.58 ac
Total Area To Be Disturbed[2]	8,122 ac	5,364 ac	5,465 ac	3,689 ac
Permit Area[2]	9,283.78 ac	6,110 ac	6,205 ac	4,131 ac
Average Annual Post-1999 Coal Production	30 mmt	9 mmt	9 mmt	9 mmt
Remaining Life Of Mine (post-1999)	6.7 yrs	12.3 yrs	12.1 yrs	7.6 yrs
Average No. of Employees	350	18	18	18
Total Projected State Revenues (post-1999)[3]	$ 223.6 million	$ 513.8 million	$ 517.8 million	$ 313.8 million
Total Projected Federal Revenues (post-1999)[4]	$ 75.7 million	$ 173.9 million	$ 175.1 million	$ 106.2 million

Footnotes:

[1] Assumes 90 percent recovery of leased coal.

[2] For the Proposed Action and Alternatives 2 and 3, the disturbed acreage exceeds the leased acreage because of the need for highwall reduction, topsoil removal and other activities outside the lease boundaries. The permit area is larger than leased or disturbed areas to assure that all disturbed lands are within the permit boundary and to allow easily defined legal land description.

[3] Projected revenue to the State of Wyoming is $1.10 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments (University of Wyoming 1994).

[4] Federal revenues based on $4.00 per ton price x federal royalty of 12.5 percent x amount of recoverable coal plus bonus payment on LBA coal of $0.22 per ton based on average of last nine LBA's (Table 1-1) x amount of leased coal less state's 50 percent share.

averages 51.5 feet in thickness, and the Lower Wyodak seam averages 8.2 feet in thickness. The average overburden thickness is about 215 ft. The intervals between the coal seams range from a few feet to more than 20 feet.

The existing topography on the LBA Tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. Following reclamation, the average surface elevation would be lower due to removal of the coal. The reclaimed land surface would approximate premining contours and the basic drainage network would be retained, but the reclaimed surface would contain fewer, gentler topographic features. This could contribute to reduced habitat diversity and wildlife carrying capacity on the LBA Tract. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

The geology from the base of the coal to the land surface would be subject to considerable long-term change on the LBA Tract under any action alternative. An average of 214 ft of overburden, 3 ft of interburden and 64 ft of coal would be removed from the LBA Tract. The replaced overburden would be a relatively homogeneous mixture compared to the premining layered overburden.

Development of other minerals potentially present on the LBA Tract could not occur during mining, but could occur after mining. Conventional oil and gas wells would have to be plugged and abandoned during mining but could be recompleted after mining if the remaining reserves justify the expense of the recompletion. There are 21 active conventional oil and gas wells located on the tract under the Proposed Action and Alternative 2, and 14 active wells under Alternative 3. CBM resources associated with the coal that are not recovered prior to mining would be vented to the atmosphere and irretrievably lost when the coal is removed. Approximately 60 CBM drilling locations are present on the LBA Tract if one well is drilled on every 80-acre spacing unit in the tract. As of September 1, 2000, 42 applications to drill CBM wells had been received. BLM's policy is to optimize recovery of both resources, ensure the public receives a reasonable return, and encourage agreements between lessees or use BLM authority to minimize loss of publicly-owned resources. An agreement on how to coordinate recovery of both resources could help increase CBM recovery prior to mining and reduce scheduling impacts to the coal mining. Without an agreement, CBM recovery could be reduced, coal mining could be postponed, or coal may not be recovered.

Consequences to soil resources from mining the LBA Tract would include changes in the physical, biological, and chemical properties. Following reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, microbial populations, and chemical composition. The replaced topsoil would be much more uniform in type, thickness, and texture. It would be adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Moderately adverse short-term impacts to air quality would be extended onto the North Jacobs Ranch LBA Tract during the time it is mined if a lease is issued. Dust would be visible to the public when mining occurs near State Highways 59 or 450 or the Hilight Road. TSP concentrations would be elevated in the vicinity of mining operations on the LBA Tract, but would not violate federal or Wyoming primary and secondary standards outside the mine's permit boundary, even with increased production and when emissions from adjacent mines are considered. Concentrations of gaseous emissions would remain within acceptable federal and state standards.

Changes in runoff characteristics and sediment discharges would occur during mining of the LBA Tract, and erosion rates could reach high values on the disturbed areas because of vegetation removal. However, state and federal regulations require that surface runoff from mined lands be treated to meet effluent standards, so sediment would be deposited in ponds or other sediment-control devices. After mining and reclamation are complete, surface water flow, quality, and sediment discharge would approximate premining conditions.

Mining the LBA Tract would increase both the area of lowered water levels in the coal and overburden aquifers and the area where the existing coal and overburden aquifers would be replaced by mine backfill. Drawdown in the continuous coal aquifer would be expected to increase roughly in proportion to the increase in area affected by mining and would extend farther than drawdown in the discontinuous overburden aquifers. The data available indicate that hydraulic properties of the backfill would be comparable to the premining overburden and coal aquifers. Total dissolved solids levels in the backfill could initially be expected to be higher than in the premining overburden and coal aquifers, but would be expected to meet Wyoming Class III standards for use as stock water.

Based on preliminary AVF determinations, it is unlikely that any portions of the LBA tract meet the criteria to be AVF's significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process. Jurisdictional wetlands that are disturbed by mining must be replaced during the reclamation process.

Mining would progressively remove the native vegetation on the LBA Tract. Reclamation and revegetation of this land would occur contemporaneously with mining. Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures, which are approved by the WDEQ. The majority of these species would be native to the LBA Tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. Estimates for the time it would take to restore sagebrush to premining density levels range from 20 to 100 years. An indirect impact associated with this vegetative change would potentially be a decreased big game habitat carrying capacity. However, a diverse, productive, and permanent vegetative cover would be established on the LBA Tract within about 10 years following reclamation, prior to release of the final reclamation bond. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land uses (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. The reclamation plans for the LBA Tract would also include steps to control invasion by weedy (invasive, nonnative) plant species. The surface of the LBA Tract is privately owned, and the private landowners would have the right to manipulate the vegetation on their lands as they desire once the final reclamation bond is released.

Surveys have been conducted to determine the presence of potential habitat for T&E or candidate plant species, but no suitable habitat has been found on the North Jacobs Ranch LBA Tract.

In the short term, wildlife would be displaced from the LBA Tract in areas of active mining and the acreage of habitat available for wildlife populations would be reduced. However, the LBA Tract does not contain any unique or crucial big game habitat, and habitat would be disturbed in parcels, with reclamation progressing as new disturbance occurs. In the long term, following reclamation, carrying capacity and habitat diversity may be reduced due to flatter topography, less diverse vegetative cover and reduction in sagebrush density.

T&E wildlife surveys specific to the proposed lease tract were conducted in the summer of 1999. No T&E species or potential habitat were found on the tract for the bald eagle, black-footed ferret, or mountain plover during those surveys. There have been no sitings of swift foxes on the LBA Tract or adjacent lands, and there are no prairie dog colonies on the tract.

Active mining would preclude other land uses. Recreational use of the LBA Tract would be severely limited during mining; however, there is no public surface included in the tract. Within 10 years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. The cumulative impacts of energy development (coal mining, oil and gas) in the PRB are and will continue to contribute to a reduction in hunting opportunities for some animals (pronghorn, mule deer, and sage grouse).

Mining would also impact oil and gas development on the leased lands during active mining. The federal oil and gas rights are leased. As discussed above, there are active conventional oil and gas wells on the tract under the Proposed Action and Alternatives 2 and 3, and CBM wells are currently being drilled. Existing active wells would have to be plugged and abandoned prior to mining. New drilling would not be possible in areas of active mining, but could potentially take place in areas not being mined, or in reclaimed areas. CBM that is not recovered prior to mining would be vented and irretrievably lost as the coal is removed.

Cultural resources on the LBA Tract would be impacted by mining, but adverse impacts would be mitigated through data recovery and/or avoidance of significant properties. Formal Wyoming SHPO consultation is required for concurrence with determination of the eligibility of sites for inclusion on the NRHP prior to mining. The eligible cultural properties on the LBA Tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation, or data recovery program is developed in consultation with the SHPO.

No sites of Native American religious or cultural importance have been identified on the LBA Tract. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

No unique or significant paleontological resources have been identified on the North Jacobs Ranch LBA Tract, and the likelihood of encountering significant paleontological resources is small.

Mining activities at the existing Jacobs Ranch Mine are currently visible from the Hilight Road and State Highway 450, and mining activities on the North Jacobs Ranch LBA Tract would also be visible from these roads. Mining would affect landscapes classified by BLM as VRM Class IV, and the landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the LBA Tract.

Impacts from noise generated by mining activities on the LBA Tract are not expected to be significant due to the remote nature of the site.

No new or reconstructed transportation facilities would be required under the Proposed Action or Alternatives 2 or 3. Leasing the LBA Tract would extend the length of time that coal is shipped from the permitted Jacobs Ranch Mine. Active pipelines and utility lines would have to be relocated in accordance with previous agreements, or agreements would have to be negotiated for their removal or relocation.

Royalty and bonus payments for the coal in the LBA Tract would be collected by the federal government and split with the state. A 1994 University of Wyoming study estimated that the total direct fiscal benefit to the State of Wyoming from coal mining taxes and royalties is $1.10/ton of coal mined. Using that estimate, mining the coal in the North Jacobs Ranch LBA Tract under the action alternatives would provide a tax and royalty benefit to the State of Wyoming of $313.8 to $513.8 million, expressed in current dollars. Mine life, and thus employment, would be extended roughly 8 to 13 years at the Jacobs Ranch Mine, and JRCC projects that employment at the mine would increase by up to 18 people.

With regard to Environmental Justice issues, it was determined that potentially adverse impacts do not disproportionately affect minorities, low-income groups or Native American tribes or groups. No tribal lands or Native American communities are included in this area, and no Native American treaty rights or Native American trust resources are known to exist for this area.

Under the No Action Alternative, the impacts described in the preceding paragraphs to topography and physiology, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Jacobs Ranch coal leases, but these impacts would not be extended onto the LBA Tract.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. BLM has not identified additional special stipulations that should be added to the BLM lease or areas where additional or increased monitoring measures are recommended.

One issue of current concern is the release of NO_x from blasting, and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind. As a result of this concern, industry and agency representatives have met and discussed possible causes and solutions, including improving blasting techniques or explosives, reducing powder factors, and analyzing the composition of the orange clouds, and these procedures are being evaluated. BLM supports the continuing efforts of the involved regulatory agencies to evaluate and develop appropriate procedures and techniques to resolve this problem.

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

Since decertification of the Powder River Federal Coal Region in 1990, the BLM Wyoming State Office has issued 10 new federal coal leases containing approximately 2.747 billion tons of coal using the LBA process. This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

Eight additional coal lease applications, including the North Jacobs Ranch application, are currently pending. The pending LBA applications contain approximately 2.3 billion tons of coal.

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996. The purpose of this study was to document actual mineral development impacts in the Powder River Basin from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared Powder River Basin regional EISs. This study concluded that, in general, the levels of development in 1995 were within the levels predicted in the previously prepared regional EISs. The status check was updated prior to the 1997 and 1999 PRRCT public meetings in Casper, Wyoming and Billings, Montana.

Four of the previously prepared regional EISs evaluated coal development in the Powder River Basin in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Coal Basin of Wyoming, BLM, October 1974;

Final Environmental Impact Statement, Eastern Powder River Coal, BLM, March 1979;

Final Environmental Impact Statement, Powder River Coal Region, BLM, December 1981;

Draft Environmental Impact Statement, Round II Coal Lease Sale, Powder River Region, BLM, January 1984.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*," by Martin and others.

Since 1989, coal production in the Powder River Basin has increased by approximately 6.8 percent per year. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales. Oil production has decreased in the Wyoming Powder River Basin since 1990. In recent years, more wells have been plugged annually than have been drilled.

Natural gas production has been increasing, particularly in Campbell County, due to the development of shallow CBM resources west of the coal mines. CBM exploration and production is currently ongoing throughout the PRB in Wyoming and it is estimated that there are now more than 2,500 wells producing. Since the early 1990's, the BLM has completed numerous EAs and two EISs analyzing CBM projects. The last EIS was the Wyodak CBM Project EIS, which was completed in 1999. The Wyodak EIS project area included 3,600 square miles of mixed federal, state, and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM is currently preparing an EA to analyze the impacts of drilling as many as 2,500 additional federal drainage protection wells within the Wyodak EIS project area. These wells would be drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases that are adjacent to and potentially being drained by wells drilled on private or state oil and gas leases. BLM is also preparing an EIS to analyze the cumulative impacts of reasonably foreseeable CBM and conventional oil and gas development within the Wyoming portion of the PRB. The regional coal EISs (BLM 1974, 1979, 1981, 1984) and the Buffalo RMP (BLM 1985) analyzed oil and gas development but did not anticipate that the oil and gas development would include production of CBM resources. Under the current process for approving CBM drilling, CBM wells can be drilled on private and state oil and gas leases after approval by the WOGCC and the Wyoming SEO. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling can be authorized.

Water and methane are produced from the coal by CBM wells, and the area of CBM development in the PRB is west of the existing coal mines. Therefore, the potential exists for overlapping groundwater drawdown in the coal if both resources are produced. Currently, CBM production in the vicinity of the group of the five mines nearest the LBA Tract is limited, but production will increase in this area as pipeline capacity increases. As CBM production is established adjacent to the five southern mines, the resulting groundwater withdrawal from the Wyodak coal would overlap additively with groundwater drawdown in the Wyodak caused by coal mining.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently two *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. Wyoming uranium production is expected to decrease this year.

In addition to the ongoing coal and CBM development, four other projects were recently completed, in progress or planned during the preparation of this EIS in the vicinity of the southern mine group: 1) construction and operation of the ENCOAL Plant within the rail loop at the North Rochelle Mine; 2) construction and operation of the Two Elk power plant east of the Black Thunder Mine; 3) construction and operation of the Wygen #1 power plant at the Wyodak mine site; and 4) construction and use of the proposed DM&E rail line. Air quality, water quantity and quality, and employment levels in particular may be cumulatively impacted if these projects are added to existing coal mining and CBM production. The duration of these cumulative impacts would be extended by leasing the LBA Tract.

The existing and proposed development in the PRB has and will continue to result in the introduction of additional roads, railroads, power lines, fences, mine structures, and oil and gas production equipment. This area has already undergone change from a semi-agriculturally based economy to a coal mining and oil and gas economy. Environmentally, the open, basically treeless landscape has been visibly altered by construction, equipment, and human activities. Leasing of the LBA Tract would increase the total area that would be affected by mining but would not cause a significant cumulative change in daily impacts because it is an extension of an ongoing operation and mining disturbance is progressive with reclamation proceeding contemporaneously. Cumulative impacts vary by resource and range from being almost undetectable to being substantial. Cumulative impacts on air quality, groundwater quantity and wildlife habitat (particularly antelope) have created the greatest concern.

A regional cumulative impact analysis was performed for the Horse Creek Coal Lease Application EIS in 1999 to estimate impacts on air quality in the year 2015. This analysis was an update and modification to the far-range cumulative air quality analysis prepared for the Wyodak Coal Bed Methane Project EIS. Tables ES-2 and ES-3 show the results of this analysis. The results show that the maximum projected cumulative impacts on air quality are much smaller than regulatory standards and increments (Table ES-2). However, the predicted impacts to visibility are significant, particularly at Badlands National Park (Table ES-3).

Figure ES-3 shows modeled and extrapolated worst-case coal aquifer drawdown as a result of mining at the southern group of mines. Monitoring

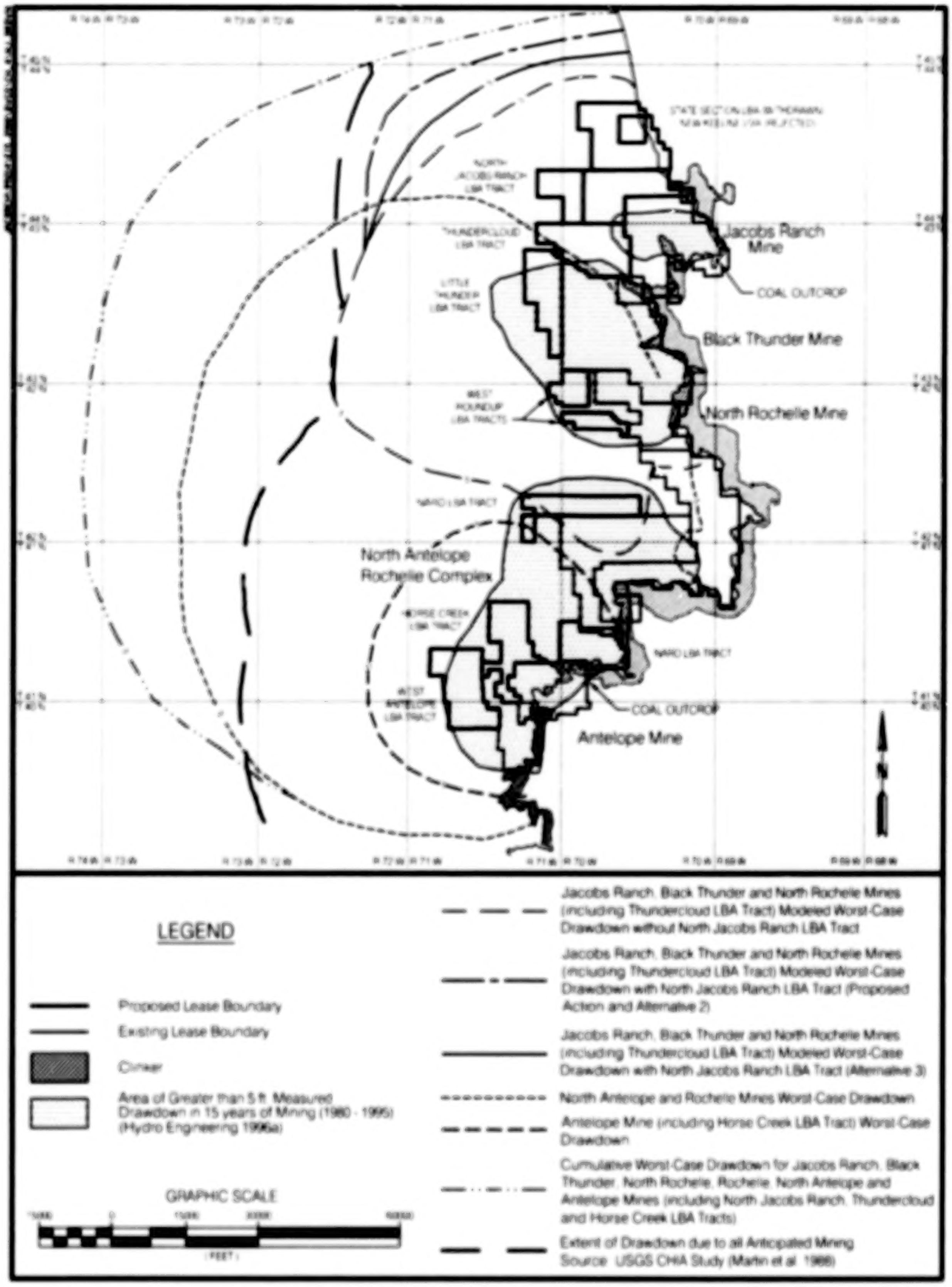
Table ES-2. Results of Air Quality Impact Analysis ($\mu g/m^3$)

Area	**Annual NO_2**	**24-hr PM_{10}**	**Annual PM_{10}**	**3-hr SO_2**	**24-hr SO_2**	**Annual SO_2**
CUMULATIVE IMPACTS						
Northern Cheyenne Reservation, MT	0.03	0.58	0.02	1.60	0.56	0.02
Badlands National Park, SD	1.26	0.65	0.10	3.61	1.20	0.21
Wind Cave National Park, SD	0.16	0.62	0.06	2.17	0.84	0.08
Class I PSD Increment	**2.5**	**4**	**8**	**25**	**5**	**2**
Black Elk Wilderness, SD	0.09	1.04	0.05	2.48	0.79	0.07
Jewel Cave National Monument, SD	0.13	0.76	0.08	3.92	0.87	0.10
Mt. Rushmore National Monument, SD	0.08	1.01	0.05	1.93	0.55	0.06
Cloud Peak Wilderness, WY	0.01	0.90	0.04	1.08	0.32	0.01
Devils Tower National Monument, WY	0.13	0.80	0.16	2.84	0.50	0.07
National Ambient Air Quality Standard	**100**	**150**	**50**	**1300**	**365**	**80**

Table ES-3. Predicted Annual Days of Visibility Reductions At Class I and Class II Sensitive Areas from Cumulative Sources

Location	**Type of Area**	**Number of Days deciview change >0.5**	**Number of Days deciview change >1.0**
Northern Cheyenne Reservation	Class I	18	8
Badlands National Park	Class I	173	70
Wind Cave National Park	Class I	94	45
Black Elk Wilderness	Class II	66	28
Jewel Cave National Monument	Class II	72	32
Mt. Rushmore National Monument	Class II	58	22
Cloud Peak Wilderness	Class II	15	4
Devils Tower National Monument	Class II	70	28

Note: The Northern Cheyenne Reservation is a redesignated Class I area and is not addressed by existing visibility regulations which apply to the federally mandated Badlands and Wind Cave Class I areas.


NORTH JACOBS RANCH LBA TRACT
THUNDERCLOUD LBA TRACT
LITTLE THUNDER LBA TRACT
WEST ROUNDUP LBA TRACTS
NARO LBA TRACT
Jacobs Ranch Mine
COAL OUTCROP
Black Thunder Mine
North Rochelle Mine
North Antelope Rochelle Complex
HORSE CREEK LBA TRACT
NARO LBA TRACT
WEST ANTELOPE LBA TRACT
COAL OUTCROP
Antelope Mine
N
LEGEND
Proposed Lease Boundary
Existing Lease Boundary
Clinker
Area of Greater than 5 ft. Measured Drawdown in 15 years of Mining (1980 - 1995) (Hydro Engineering 1996a)
GRAPHIC SCALE
(FEET)
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown without North Jacobs Ranch LBA Tract
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown with North Jacobs Ranch LBA Tract (Proposed Action and Alternative 2)
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown with North Jacobs Ranch LBA Tract (Alternative 3)
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Cumulative Worst-Case Drawdown for Jacobs Ranch, Black Thunder, North Rochelle, Rochelle, North Antelope and Antelope Mines (including North Jacobs Ranch, Thundercloud and Horse Creek LBA Tracts)
Extent of Drawdown due to all Anticipated Mining
Source: USGS CHIA Study (Martin et al. 1988)

Figure ES-3. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns.

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of backfill areas indicates that reclaimed areas are being recharged with water generally suitable for livestock use (the premining use).

Wildlife habitat quality has declined in the PRB due to a continuing trend of landscape fragmentation from roads, rail lines, oil and gas wells, coal mines, and fences. Mining of the LBA tract would add to this habitat fragmentation. Wildlife monitoring indicates that wildlife are using reclaimed areas.

This EIS presents the BLM's analysis of environmental impacts under authority of the NEPA and associated rules and guidelines. The BLM will use this analysis to make a leasing decision. The decision to lease these lands is a necessary requisite for mining, but is not in itself the enabling action that will allow mining. The most detailed analysis prior to mine development would occur after the lease is issued, when the lessee files an application for a surface mining permit and mining plan approval, supported by extensive proposed mining and reclamation plans, to the WDEQ.

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Abbreviations and Acronyms Used in this Report

ACC	Antelope Coal Company
ANC	acidification neutralization capacity
ac-ft	acre-foot, acre-feet
ac-ft/yr	acre-foot per year, acre-feet per year
AQRV	air quality related values
ARCO	Atlantic Richfield Company
AREV	SEO water rights database and program
AVF	alluvial valley floor
BACT	best available control technology
bcy	bank cubic yards
BLM	Bureau of Land Management
BN-UP, BN&UP	Burlington Northern-Union Pacific
B.P.	before present
Btu	British thermal units
Btu/lb	British thermal units per pound
CBM	coal bed methane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CHIA	Cumulative Hydrologic Impact Assessment
CO	carbon monoxide
COE	U.S. Army Corps of Engineers
CREG	Consensus Revenue Estimating Group
cy	cubic yards
dBA	A-weighted decibels
DEIS	Draft Environmental Impact Statement
DM&E	Dakota, Minnesota & Eastern Railroad Corporation
DOI	Department of the Interior
dv	deciview, a measure of view impairment
EA	Environmental Assessment
EC	elemental carbon particles (re: air quality)
EIS	Environmental Impact Statement
ENCOAL	Encoal Corporation
EPA	Environmental Protection Agency
F	Fahrenheit
FCLAA	Federal Coal Leasing Act Amendments of 1976
FEA	Final Environmental Assessment
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy Management Act of 1976
FR	Federal Register
ft	feet, foot
ft/day	feet per day
ft/mile	feet per mile
GAGMO	Gillette Area Ground Water Monitoring Organization
GNP	Gross National Product
gpm	gallons per minute
GSP	Gross State Product
IBLA	Interior Board of Land Appeals
IMPROVE	Interagency Monitoring of Protected Environments
IWAQM	Interagency Workgroup on Air Quality Monitoring

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Abbreviations and Acronyms Used in this Report

JRCC	Jacobs Ranch Coal Company
Km	kilometers
KMCC	Kerr-McGee Coal Corporation
Kv	kilovolts
LAC	limits of acceptable change (re: air quality)
LBA	lease by application
lbs/mmBtu	pounds per million British thermal units
LFC	Liquids From Coal
LRMP	Land and Resource Management Plan
LW	Lower Wyodak coal seam
MBHFI	migratory birds of high federal interest
$\mu g/m^3$	micrograms per cubic meter
μeq/L	microequivalents per liter
mg/L	milligrams per liter
mi	mile
MLA	Mineral Leasing Act of 1920
mmbcy	million bank cubic yards
mmtpy	million tons per year
mph	miles per hour
MW	Middle Wyodak coal seam
Mw	megawatts
NAAQS	National Ambient Air Quality Standards
NAPG	North American Power Group
NEPA	National Environmental Policy Act of 1969
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
O_3	photochemical oxidants
OC	organic carbon particles
OSM	Office of Surface Mining Reclamation & Enforcement
P.M.	Prime Meridian
PM_{10}	particulates finer than 10 microns
PMT	postmining topography
PP&L	Pacific Power and Light Company
PRB	Powder River Basin
PRBRC	Powder River Basin Resource Council
PRCC	Powder River Coal Company
PRRCT	Powder River Regional Coal Team
PSD	prevention of significant deterioration
R2P2	Resource Recovery and Protection Plan
RMP	Resource Management Plan
ROD	Record of Decision
ROW	Right-of-Way
SARA	Superfund Amendment & Reauthorization Act of 1986
SEO	State Engineer's Office
SHPO	State Historic Preservation Office
SMCRA	Surface Mining Control and Reclamation Act of 1977
SO_2	sulfur dioxide
T&E	threatened and endangered
TBCC	Thunder Basin Coal Company
TBNG	Thunder Basin National Grassland

Abbreviations and Acronyms Used in this Report

TDS	total dissolved solids
TSP	total suspended particulates
U.S.	United States
USC, U.S.C.	United States Code
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USGS	U.S. Geological Survey
USFWS	U.S. Fish and Wildlife Service
UW	Upper Wyodak coal seam
VRM	visual resource management
WCIC	Wyoming Coal Information Committee
WDEQ	Wyoming Department of Environmental Quality
WDEQ/AQD	Wyoming Department of Environmental Quality/Air Quality Division
WDEQ/LQD	Wyoming Department of Environmental Quality/Land Quality Division
WGFD	Wyoming Game and Fish Department
WMA	Wyoming Mining Association
WOC	Wyoming Outdoor Council
WOGCC	Wyoming Oil and Gas Conservation Commision

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1.0 INTRODUCTION

On October 2, 1998, JRCC[1] filed an application with the BLM for federal coal reserves located north of and adjacent to the Jacobs Ranch Mine in Campbell County, Wyoming. The application area is located in southern Campbell County, Wyoming, approximately 7 miles east of Wright, Wyoming (Figure 1-1). The federal coal reserves were applied for as a maintenance tract for the Jacobs Ranch Mine under the regulations at 43 CFR 3425, Leasing On Application. The Jacobs Ranch Mine is operated by JRCC, a subsidiary of the Kennecott Energy Company.

JRCC's coal lease application, which was assigned case file number WYW146744, was reviewed by the BLM Wyoming State Office Division of Mineral and Lands Authorization. They determined that it met the regulatory requirements for a lease by application or LBA. The tract is referred to as the North Jacobs Ranch LBA Tract.

The North Jacobs Ranch LBA Tract is located within the Powder River Federal Coal Region, which was decertified in January 1990. Although the Powder River Federal Coal Region is decertified, the PRRCT, a federal/state advisory board established to develop recommendations concerning management of federal coal in the region, has continued to meet regularly and review all federal lease applications in the region. The PRRCT reviewed this lease application at public meetings held on February 23, 1999, in Billings, Montana, and October 27, 1999, in Gillette, Wyoming. The PRRCT recommended that the lease application be processed, pending resolution of the conflicts between proposed coal mining and existing and proposed oil and gas development, including CBM on the tract.

In order to process an LBA, the BLM must evaluate the quantity, quality, maximum economic recovery, and fair market value of the federal coal and fulfill the requirements of NEPA by evaluating the environmental impacts of leasing the federal coal. BLM does not authorize mining by issuing a lease for federal coal, but the impacts of mining the coal are considered in this EIS because it is a logical consequence of issuing a lease. This EIS has been prepared to evaluate the site-specific and cumulative environmental impacts of leasing and developing the federal coal included in the application area. Scoping for the North Jacobs Ranch lease application was initially conducted from October 1 to October 30, 1999. Additional scoping comments were requested in the Notice of Intent to Prepare an EIS, published in the Federal Register on January 19, 2000. A public scoping meeting was held in Gillette, Wyoming on October 19, 1999. BLM will use the analysis in this EIS to decide whether or not to hold a public, competitive, sealed-bid coal lease sale for the coal tract and issue a federal coal lease. If the sale

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

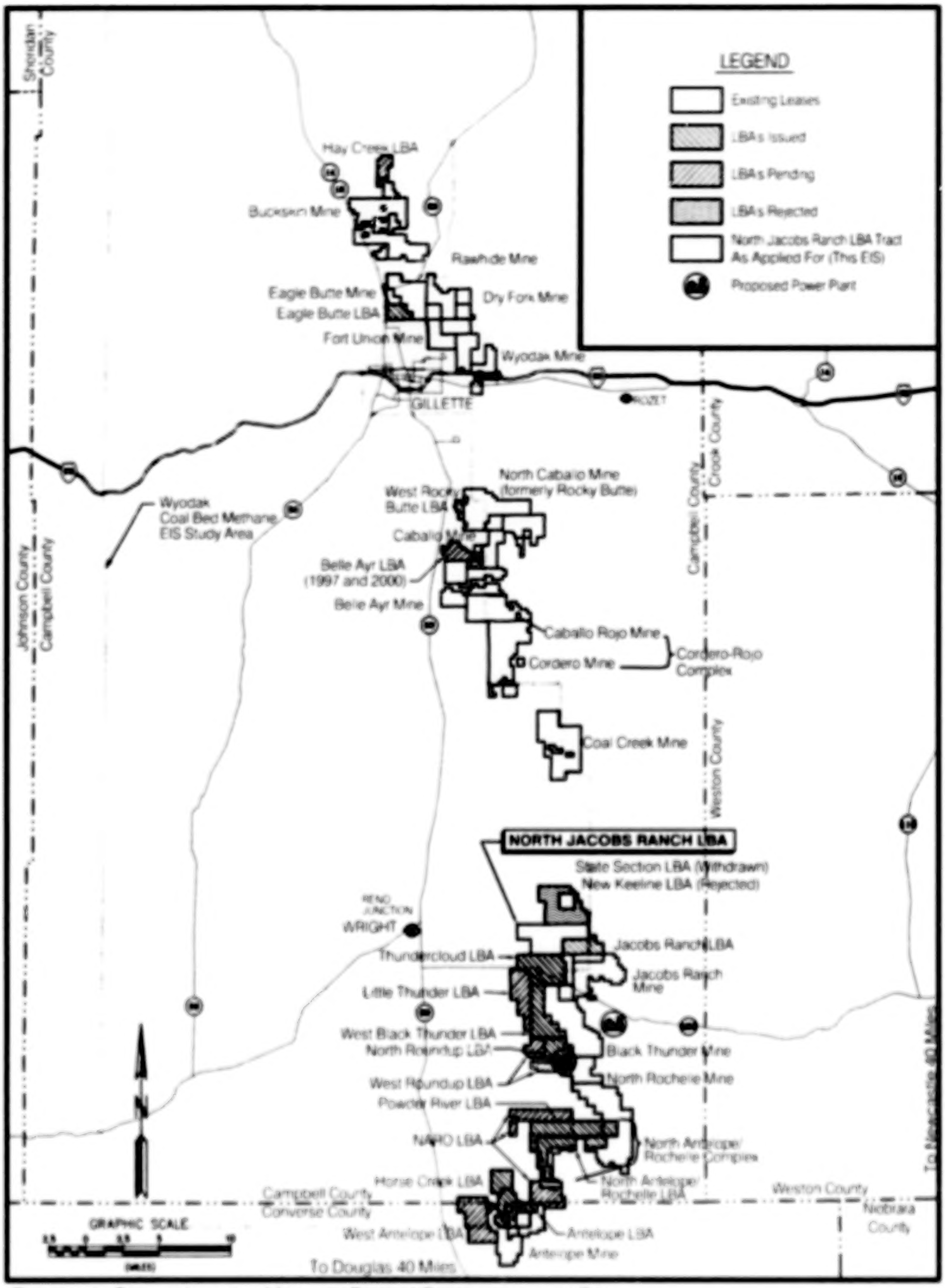

Figure 1-1. General Location Map with Federal Coal Leases and LBA's

is held, the bidding at the sale is open to any qualified bidder; it is not limited to the applicant. If the lease sale is held, a lease will be issued to the highest bidder at the sale if a federal sale panel determines that the high bid meets or exceeds the fair market value of the coal as determined by BLM's economic evaluation and if the U.S. Department of Justice determines that there would be no antitrust violations if a lease is issued to the high bidder.

Since decertification of the Powder River Federal Coal Region, ten federal coal leases have been sold at competitive sealed-bid sales and one federal coal lease has been exchanged in the Wyoming portion of the Powder River Federal Coal Region (Table 1-1). One of these new federal coal leases was issued to Jacobs Ranch Mine after they submitted the successful bid for a maintenance tract also adjacent to the Jacobs Ranch Mine on October 1, 1992 (Figure 1-1 and Table 1-1). As shown in Table 1-2, eight additional applications, including the North Jacobs Ranch application, are currently pending. The North Jacobs Ranch LBA Tract was previously applied for by Evergreen Enterprises as part of the New Keeline LBA. The New Keeline LBA was rejected by the BLM in 1997. Evergreen Enterprises appealed the rejection of the New Keeline LBA to the IBLA in 1997 and submitted a new application, which covered the same area, in January, 2000 (State Section LBA). Evergreen Enterprises withdrew their appeal of the New Keeline LBA rejection and their application for the State Section LBA in September, 2000.

Other agencies may use this analysis to make decisions related to leasing and mining the federal coal in this tract. OSM, the federal agency responsible for regulating surface coal mining operations, is a cooperating agency on this EIS. OSM will use this EIS to make decisions related to the approval of the MLA mining plan for this tract, if a lease is issued.

The North Jacobs Ranch LBA Tract as applied for and the existing federal coal leases in the adjacent Jacobs Ranch Mine are shown in Figure 1-2. As applied for, the North Jacobs Ranch LBA Tract includes approximately 4,821.19 acres and an estimated 519 million tons of in-place coal reserves. JRCC estimates that approximately 467.1 million tons of coal will be produced from the North Jacobs Ranch LBA Tract as applied for, assuming a recovery factor of 90 percent.

The North Jacobs Ranch LBA Tract is contiguous with both the Jacobs Ranch Mine and the Black Thunder Mine, owned by Ark Land Company, a subsidiary of Arch Coal, Inc. (Figure 1-1). The area applied for is substantially similar to the adjacent mines for which detailed site-specific environmental data have been collected and for which environmental analyses have previously been prepared to secure the existing leases and the necessary mining permits.

The surface of the North Jacobs Ranch LBA Tract is owned by Jacobs

Table 1-1. Leases Sold Since Decertification, Powder River Basin, Wyoming

LBA/Exchange Name Lease # Applicant or Applicant Mine	**Application Date Effective Date**	**Acres[1]**	**Mineable Tons of Coal[1]**	**Successful Bid**	**Successful Bidder (Mine)**
Jacobs Ranch LBA WYW117924 Jacobs Ranch Mine	10/10/89 10/1/92	1,708.620	147,423,560	$20,114,930.00	Jacobs Ranch Mine
West Black Thunder LBA WYW118907 Black Thunder Mine	12/22/89 10/1/92	3,492.495	429,048,216	$71,909,282.69	Black Thunder Mine
N. Antelope/Rochelle LBA WYW119554 N. Antelope/Rochelle Mine	3/2/90 10/1/92	3,064.040	403,500,000	$86,987,765.00	North Antelope/ Rochelle Mine
West Rocky Butte LBA WYW122586 No Existing Mine[2]	12/4/90 1/1/93	463.205	56,700,000	$16,500,000.00	Rocky Butte Mine
Eagle Butte LBA WYW124783 Eagle Butte Mine	8/1/95 7/25/98	1,059.175	166,400,000	$18,470,400.00	Eagle Butte Mine
Antelope LBA WYW128322 Antelope Mine	1/29/92 2/1/97	617.20	60,364,000	$9,054,600.00	Antelope Mine
North Rochelle LBA WYW127221 North Rochelle Mine	7/22/92 1/1/98	1,481.930	157,610,000	$30,576,340.00	North Rochelle Mine
Powder River LBA WYW136142 N. Antelope/Rochelle Mine	3/23/95 9/1/98	4,224.225	532,000,000	$109,596,500.00	North Antelope/ Rochelle Mine
Thundercloud LBA WYW136458 Jacobs Ranch Mine	4/14/95 1/1/99	3,545.503	412,000,000	$158,000,008.50	Black Thunder Mine
EOG (Belco) I-90 Lease Exchange WYW150152 EOG (formerly Belco)	Issued pursuant to Public Law 95-554, lease effective 4/1/00	599.17	106,000,000	Exchanged for rights to Belco I-90 Lease (WYW0322794)	EOG (Belco)
Horse Creek LBA WYW141435	2/14/97	2,818.695	275,577,000	$91,220,120.70	Antelope Coal Co.
TOTALS		**23,074.26**	**2,746,622,776**	**$612,429,946.89**	

[1] Information from Sale Notice

[2] The West Rocky Butte Lease is now owned by the Caballo Mine

Table 1-2. Pending LBA's, Powder River Basin, Wyoming

PENDING LBA's[3]

LBA Lease# Applicant Mine	**Application Date**	**Acres**	**Estimated Tons of Coal**[1]	**Status**
Belle Ayr LBA 2000 WYW141568 Belle Ayr	7/28/00	243.61	29 mm	PRRCT reviewed on 10/25/00
N. Jacobs Ranch LBA WYW146744 Jacobs Ranch	10/2/98	4,821.19	519 mm	PRRCT Reviewed on 2/23/99, 10/27/99 & 10/25/00
State Section[2] WYW149882 New Start Mine	1/31/00			WITHDRAWN
NARO (WYW150210) North Antelope/ Rochelle	3/10/00	4,501.0 Total N. Parcel = 2,368.3; S. Parcel = 2,132.7	564 mm Total N. Parcel = 323 mm S. Parcel = 241 mm	PRRCT reviewed on 10/25/00
Little Thunder (WYW150318) Black Thunder	3/23/00	2,709.5	About 384 mm	PRRCT reviewed on 10/25/00
West Roundup (WYW151134) North Rochelle	7/28/00	1,868.12	173 mm	PRRCT reviewed on 10/25/00
Hay Creek (WYW151634) Buckskin	8/31/00	1,015.51	135 mm	PRRCT reviewed on 10/25/00
West Antelope (WYW151643) Antelope	9/12/00	3,500.84	292.5	PRRCT reviewed on 10/25/00
Belle Ayr 1997 (WYW151568) Belle Ayr	3/20/97	1,335.39	171 mm	PRRCT reviewed 4/23/97, 10/27/99, & 10/25/00
TOTAL PENDING		19,995.16	2,267.5 mm	

[1] Estimated tons of coal as reported in the lease application.

[2] The State Section Tract includes all of the New Keeline Tract (WYW138975) which was applied for in 1996 and rejected in 1997. The rejection was under appeal to the IBLA, although the applicant withdrew their appeal and their application for the State Section LBA in September 2000.

[3] P&M Coal Company has proposed an exchange of private surface for federal coal. The acres and tons of coal offered will be determined by fair market value analysis. This exchange proposal was presented to the PRRCT at the October 27, 1999 meeting.

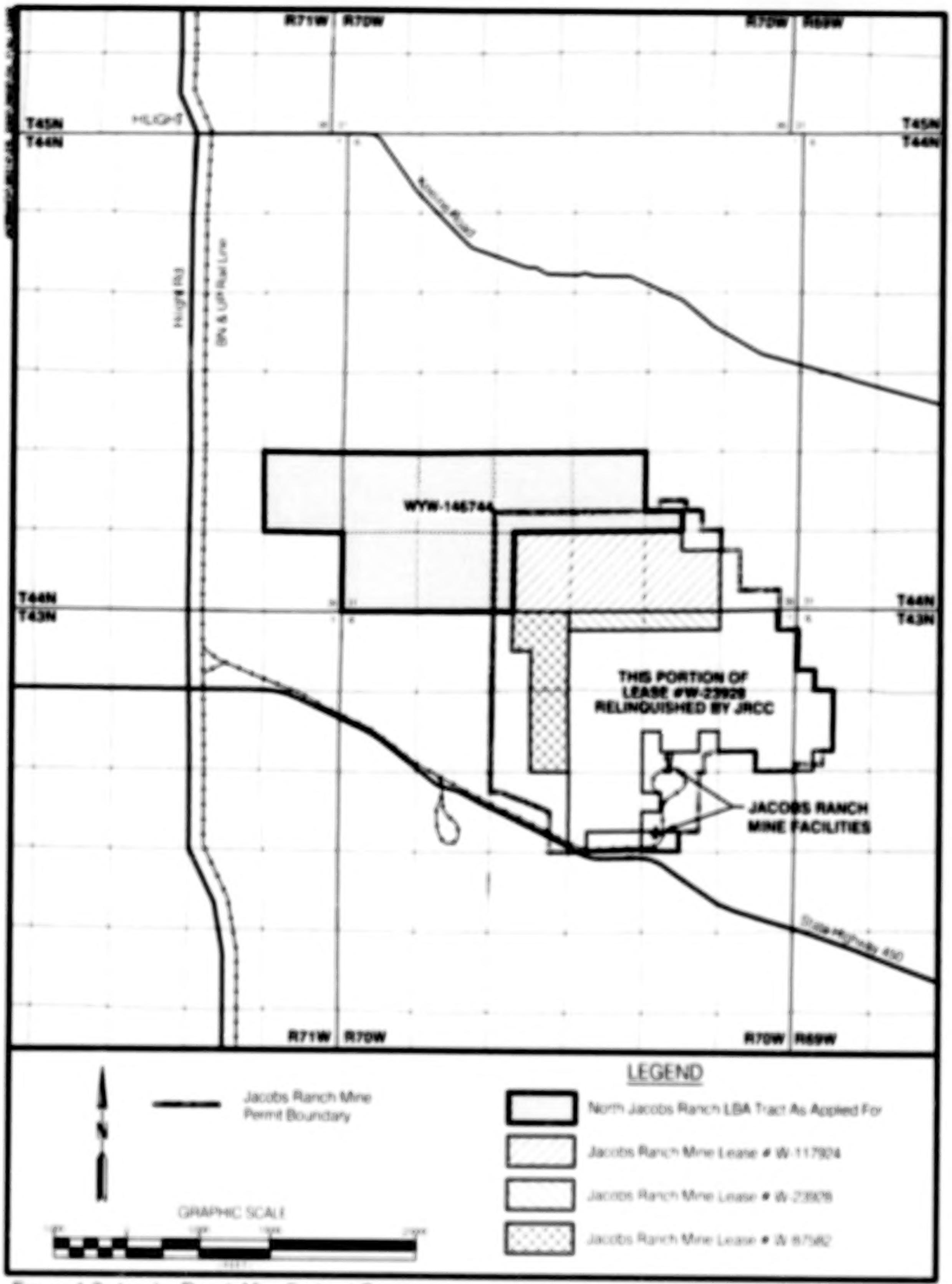

Figure 1-2 Jacobs Ranch Mine Federal Coal Leases and the North Jacobs Ranch LBA Tract As Applied For

Land and Livestock Company, Ark Land Company, and Kenneth and Sylvia Revland. Current land uses of the tract include grazing by domestic animals and wildlife and oil and gas production.

If JRCC acquires a federal coal lease for these lands, the North Jacobs Ranch LBA Tract coal resources would be mined as a maintenance tract to extend mine life at the Jacobs Ranch Mine. The mining method would be truck and shovel, which is the mining method currently in use at the Jacobs Ranch Mine. The coal would be used primarily for electric power generation.

After mining, the land would be reclaimed for livestock grazing and wildlife use as is the current practice at the Jacobs Ranch Mine.

1.1 Purpose and Need for Action

BLM administers the federal coal leasing program under the Mineral Leasing Act of 1920. A federal coal lease grants the lessee the exclusive right to obtain a mining permit for, and to mine coal on, the leased tract subject to the terms of the lease, the mining permit, and applicable state and federal laws. Before a new lease can be mined, the lessee must obtain approval of a detailed mining and reclamation plan.

In return for receiving a lease, a lessee must pay the federal government a bonus equal to amount it bid at the time the lease sale was held (the bonus can be paid in five yearly installments), make annual rental payments to the federal government, and make royalty payments to the federal government when the coal is mined. Federal bonus, rental and royalty payments are equally divided with the state in which the lease is located.

The Jacobs Ranch Mine, as currently permitted, includes 9,283.78 acres and originally contained approximately 614.7 million tons of mineable coal. As of January 1, 2000, JRCC had an estimated 225.9 million tons of mineable coal reserves remaining at the mine, and the company estimates that approximately 203.3 million tons of those remaining reserves are recoverable. JRCC's currently approved (by WDEQ/AQD) air quality permit allows up to 38 million tons of coal per year to be mined through year 2001, and 50 mmtpy in 2002 through 2004. The mine produced approximately 29.1 million tons of coal in 1999. JRCC estimates that, under their current mine plan, the existing recoverable reserves at the Jacobs Ranch Mine will be depleted within 6.7 years at an average production rate of 30 mmtpy. The company has applied for the coal reserves in the North Jacobs Ranch LBA Tract to extend the life of the Jacobs Ranch Mine. The mineable coal resources included in the LBA Tract as applied for would allow the Jacobs Ranch Mine to increase production to 39 mmtpy and operate for approximately 13.3 additional years at that production rate. If the LBA Tract is leased to JRCC as a maintenance tract, the permit area for the adjacent mine would have to be amended to include the new lease area before it could be disturbed. This process takes several years to complete. JRCC is applying for federal coal reserves now so that they can negotiate new contracts and then complete the permitting process in time to meet anticipated new contract requirements.

This EIS analyzes the environmental impacts of issuing a federal coal lease and mining the federal coal in the North Jacobs Ranch lease application as required by NEPA and associated rules and guidelines. The decision to hold a competitive sale and issue a lease for the lands in this application is a prerequisite for mining the North Jacobs Ranch LBA Tract but is not in itself the enabling action that will allow mining, as discussed above. The most detailed analysis occurs after a lease has been issued but prior to mine development, when the lessee files a permit application package with the WDEQ/LQD and OSM for a surface mining permit and approval of the MLA mining plan. Authorities and responsibilities of the BLM and other concerned regulatory agencies are described in the following sections.

1.2 Regulatory Authority and Responsibility

The JRCC coal lease application was submitted and will be processed and evaluated under the following authorities:

- MLA, as amended;
- the Multiple-Use Sustained Yield Act of 1960;
- NEPA;
- FCLAA;
- FLPMA; and
- SMCRA.

The BLM is the lead agency responsible for leasing federal coal lands under the MLA as amended by FCLAA and is also responsible for preparation of this EIS to evaluate the potential environmental impacts of issuing a coal lease. For the North Jacobs Ranch application, the BLM must decide whether to hold a competitive, sealed-bid lease sale for the tract as applied for, hold a competitive sealed bid lease sale for a modified tract, or reject the current lease application and not offer the tract for sale at this time.

The majority of the North Jacobs Ranch LBA Tract is included in the area covered by the BLM *Buffalo Resource Management Plan*, but sections 26 and 27, T. 44 N., R. 70 W. were included in the analysis for the area covered by the *Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan* (USFS, 1985). There are no federal surface lands managed by the USFS included in the North Jacobs Ranch LBA Tract. As a result, the USFS is not a cooperating agency on this EIS and USFS consent will not be required if a lease sale is held.

OSM is a cooperating agency on this EIS. After a coal lease is issued, SMCRA gives OSM primary responsibility to administer programs that regulate surface coal mining operations and the surface effects of underground coal mining operations. Pursuant to Section 503 of SMCRA, the WDEQ developed, and in November 1980 the Secretary of the Interior approved, a permanent program authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on nonfederal lands within the state of Wyoming. In January 1987, pursuant to Section 523(c) of SMCRA, WDEQ entered into a cooperative agreement with the Secretary of the Interior authorizing WDEQ to regulate surface coal mining operations and surface effects of underground mining on federal lands within the state.

Pursuant to the cooperative agreement, a federal coal lease holder in Wyoming must submit a permit application package to OSM and WDEQ/LQD for any proposed coal mining and reclamation operations on federal lands in the state. WDEQ/LQD reviews the permit application package to insure the permit application complies with the permitting requirements and the coal mining operation will meet the performance standards of the approved Wyoming program. OSM, BLM, and other federal agencies review the permit application package to insure it complies with the terms of the coal lease, the MLA, NEPA, and other federal laws and their attendant regulations. If the permit application package does comply, WDEQ issues the applicant a permit to conduct coal mining operations. OSM recommends approval, approval with conditions, or disapproval of the MLA mining plan to the Assistant Secretary of the Interior, Land and Minerals Management. Before the MLA mining plan can be approved, the BLM must concur with this recommendation.

If the proposed LBA Tract is leased to an existing mine, the lessee would be required to revise their coal mining permit prior to mining the coal, following the processes outlined above. As a part of that process, a new mining and reclamation plan would be developed showing how the lands in the LBA Tract would be mined and reclaimed. The revised permit area would be larger than the revised lease area in order to allow for disturbances outside the actual coal removal areas for such purposes as matching to undisturbed topography, constructing flood control and sediment control facilities, and related activities. Specific impacts which would occur during the mining and reclamation of the LBA Tract would be addressed in the mining and reclamation plans, and specific mitigation measures for anticipated impacts would be described in detail at that time.

WDEQ enforces the performance standards and permit requirements for reclamation during a mine's operation and has primary authority in environmental emergencies. OSM retains oversight responsibility for this enforcement. BLM has authority in those emergency situations where WDEQ or OSM cannot act before environmental harm and damage occurs.

BLM also has the responsibility to consult with and obtain the comments of other state or federal agencies which have jurisdiction by law or special expertise with respect to potential environmental impacts. Appendix A presents other federal and state permitting requirements that must be satisfied to mine this LBA Tract.

1.3 Relationship to BLM Policies, Plans, and Programs

In addition to the federal acts listed under Section 1.2, guidance and regulations for managing and administering public lands, including the federal coal lands in the JRCC application, are set forth in 40 CFR 1500 (Protection of Environment), 43 CFR 1601 (Planning, Programming, Budgeting), and 43 CFR 3400 (Coal Management).

Specific guidance for processing applications follow BLM Manual 3420 (Competitive Coal Leasing, BLM 1989) and the 1991 *Powder River Regional Coal Team Operational Guidelines For Coal Lease-By-Applications* (BLM 1991). The *National Environmental Policy Act Handbook* (BLM 1988) has been followed in developing this EIS.

1.4 Conformance with Existing Land Use Plans

FCLAA requires that lands considered for leasing be included in a comprehensive land use plan and that leasing decisions be compatible with that plan. The RMP for the BLM Buffalo Resource Area (BLM 1985a) governs and addresses the leasing of federal coal in Campbell County. *The Medicine Bow National Forest and Thunder Basin National Grassland Land and Resource Management Plan* (LRMP) (USFS 1985) governs and addresses the management of USFS (public) lands in the area. There are no USFS-administered lands on the North Jacobs Ranch LBA Tract, but the area of analysis for the USFS LRMP included the portion of the North Jacobs Ranch LBA tract in Sections 26 and 27, T. 44 N., R. 70 W.

Coal land use planning involves four planning screens to determine whether the subject coal is acceptable for further lease consideration. The four coal screens are:

- development potential of the coal lands;
- unsuitability criteria application;
- multiple land use decisions that eliminate federal coal deposits; and
- surface owner consultation.

Only those federal coal lands that pass these screens are given further consideration for leasing. These coal screens were applied to federal coal lands in Campbell and Converse Counties in the early 1980s by the BLM and USFS. The results were published in the Buffalo RMP and the Medicine Bow and Thunder Basin National Grassland LRMP in 1985. The majority of North Jacobs Ranch LBA Tract is located in the area covered by the BLM analysis published in the Buffalo RMP in 1985, as mentioned above. These screens were again applied to federal coal lands in Campbell and Converse Counties by BLM and USFS in 1993, but the report of this analysis has not been finalized.

A coal tract that is acceptable for further consideration for leasing must be located within areas that have been determined to have coal development potential. The lands in this coal lease application are within the area identified as having coal development potential by the BLM and the USFS in both the 1985 and 1993 coal screening analyses.

The coal leasing unsuitability criteria listed in the federal coal management regulations (43 CFR 3461) have been applied to high to moderate coal development potential lands in the BLM resource areas. Appendix B of this EIS summarizes the unsuitability criteria, describes the general findings for the Buffalo RMP and the LRMP and presents a validation of these findings for the North Jacobs Ranch LBA Tract.

As indicated in Appendix B, no lands in the North Jacobs Ranch LBA Tract were found to be unsuitable for mining.

Surface owner consultation was completed during preparation of the 1985 RMP and LRMP, and qualified private surface owners[2] with land over federal coal were provided the opportunity to have their views considered by the BLM and USFS during land use planning. Based on updated surface ownership provided by JRCC, the surface on the North Jacobs Ranch LBA Tract is owned by the Jacobs Land and Livestock Company (a wholly owned subsidiary of Kennecott Energy Company), Ark Land Co. (a wholly owned subsidiary of Arch Coal, Inc.), and Kenneth and Sylvia Revland. If a lease sale is held, BLM will review the current surface ownership in the tract, and any private surface owners who are determined to be qualified will be consulted prior to the sale.

As part of the coal planning for the LRMP and Buffalo RMP, a multiple land use conflict analysis was completed to identify and "eliminate additional coal deposits from further consideration for leasing to protect resource values of a locally important or unique nature not included in the unsuitability criteria," in accordance with 43 CFR 3420.1-4e(3). The multiple use conflict evaluation in the Buffalo RMP identified approximately 221,000 acres within Campbell, Converse, and Johnson counties that were potentially affected by multiple use conflicts in four categories (producing oil and gas fields, communities, recreation and public purpose facilities, and cultural resources). None of the multiple use conflict areas identified in the Buffalo RMP are included in the North Jacobs Ranch LBA Tract. The LRMP multiple use analysis concluded that: "there are no multiple land use conflicts of such magnitude that would require any of the lands in the review area to be withdrawn from leasing considerations."

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[2] The natural person or persons (or corporation, the majority stock of which is held by a person or persons who 1) hold legal or equitable title to the land surface, 2) have their principal place of residence on the land or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations, or receive directly a significant portion of their income, if any, from such farming or ranching operations, and 3) have met the conditions of 1 and 2 for a period of a least 3 years prior to granting of any consent to mining of their lands.

When the 1985 multiple use analysis was conducted, potential conflicts between coal development and oil and gas development were recognized but CBM development was not anticipated. The 1985 BLM RMP addressed coal and oil and gas development conflicts in two planning decisions. Decision MM-4 recommended authorizing oil and gas drilling on coal leases only where drilling would not conflict with coal mining, and Decision MM-5 recommended deferring coal leasing in producing oil and gas fields until coal development would not interfere with economic recovery of the oil and gas resource, as determined on a case by case basis. The conflicts between coal and CBM development were recognized when the 1993 multiple use analysis was prepared, but no changes were recommended to the existing RMP decisions. BLM is currently preparing an EIS which will be used to update the Buffalo RMP with respect to CBM development. In the meantime, BLM has recently identified federal oil and gas leases and corresponding lessees within existing coal leases and coal lease application areas. Those oil and gas lessees are being contacted and encouraged to develop and recover the CBM resources prior to coal mining. BLM has approved applications to drill CBM wells on federal leases inside the North Jacobs Ranch LBA tract. This approach is consistent with BLM's recently issued policy on conflicts between coal and CBM development, which is explained in BLM Instruction Memorandum No. 2000-081. BLM's policy is to optimize the recovery of both resources and ensure that the public receives a reasonable return.

In summary, all of the lands in the JRCC coal lease application have been subjected to the four coal planning screens and determined acceptable for further lease consideration. Thus, a decision to lease the federal coal lands in this application would be in conformance with the BLM Buffalo RMP, and also with the USFS LRMP.

1.5 Consultation and Coordination

Initial Involvement

BLM received the North Jacobs Ranch coal lease application on October 2, 1998. The application was initially reviewed by the BLM, Wyoming State Office, Division of Mineral and Lands Authorization. The BLM ruled that the application and lands involved met the requirements of regulations governing coal leasing on application (43 CFR 3425).

The BLM Wyoming State Director notified the Governor of Wyoming on

October 28, 1998, that JRCC had filed a lease application with BLM for the North Jacobs Ranch LBA Tract. A notice announcing the receipt of the JRCC coal lease application was published in the *Federal Register* on January 22, 1999. Copies were sent to voting and nonvoting members of the PRRCT, including the governors of Wyoming and Montana, the Northern Cheyenne Tribe, the Crow Tribal Council, the USFS, OSM, USFWS, National Park Service, and USGS.

The PRRCT reviewed this lease application at public meetings held on February 23, 1999, in Billings, Montana, and October 27, 1999, in Gillette, Wyoming. JRCC presented information about their existing mine and pending lease application to the PRRCT at both meetings. The PRRCT recommended that the lease application be processed, pending resolution of the conflicts between proposed coal mining and existing and proposed oil and gas development (including CBM) on the tract. The major steps in processing an LBA are shown in Appendix C.

The BLM filed a Notice of Scoping in the *Federal Register* on October 7, 1999. The filing served as notice that the JRCC coal lease application had been received and public comment was requested.

A public scoping meeting was held on October 19, 1999 in Gillette, Wyoming. At the public meeting, JRCC personnel orally presented information about their mine and their need for the coal. The presentation was followed by a question and answer period, during which six oral comments were made. The scoping period extended from October 1 through October 30, 1999, during which time BLM received nine written comments.

The BLM filed a Notice of Intent to Prepare an Environmental Impact Statement in the *Federal Register* on January 19, 2000. This filing also provided additional time for submitting scoping comments. One additional written scoping comment was received during this second scoping period.

Chapter 5.0 provides a list of other federal, state, and local governmental agencies that were consulted in preparation of this EIS (Table 5-1) and the distribution list for this EIS (Table 5-3).

Issues and Concerns

Issues and concerns expressed by the public and government agencies relating to the JRCC coal lease application and previous coal lease applications included:

- Potential conflicts with existing conventional oil and gas development and proposed CBM development;
- Enlarging the tract to increase the potential for development of a new mine and to avoid potentially bypassing coal;
- Cumulative impacts of mineral development to all other resources;
- Validity and currency of resource data;
- Public access;

- Potential impacts to threatened and endangered species and other species of concern;
- Potential air quality impacts (including cumulative impacts to visibility);
- Potential surface and groundwater quality and quantity impacts;
- Potential impacts of and possible mitigation for nitrogen oxide emissions resulting from blasting of coal and overburden;
- The need to include reasonably foreseeable actions such as the construction and operation of the DM&E railroad in the cumulative analysis;
- The need to address increasing coal production in the Powder River Basin in the cumulative analysis;
- potential impacts on cultural and paleontological resources;
- wetland impacts;
- short- and long-term impacts on fish and wildlife.

Draft EIS

Parties on the distribution list are being sent copies of this DEIS, and copies are being made available for review at the BLM offices in Casper and Cheyenne. A notice announcing the availability of the DEIS will be published in the *Federal Register* by the EPA. The BLM will publish a Notice of Availability/Notice of Public Hearing in the *Federal Register*. A 60-day comment period on the DEIS will commence with publication of the Notice of Availability. The BLM *Federal Register* notice will announce the date and time of a public hearing and will be used to solicit public comments on the DEIS and on the fair market value, the maximum economic recovery, and the proposed competitive sale of coal from the LBA Tract. A formal public hearing will be held.

Final EIS and Future Involvement

All comments received on the DEIS will be included, with agency responses, in the FEIS. Availability of the FEIS will be published in the *Federal Register* by the BLM and the EPA. After a 30-day availability period, BLM will make a decision to hold or not to hold a competitive lease sale and issue a lease for the federal coal for this tract. A public ROD for the tract will be mailed to parties on the mailing list and others who commented on this LBA during the NEPA process. The public and/or the applicant can appeal the BLM decision to hold or not to hold a competitive sale and issue a lease for the tract. The BLM decision must be appealed within 30 days after it is signed. The decision can be implemented at that time if no appeal is received. If a competitive lease sale is held, the lease sale will follow the procedures set forth in 43 CFR 3422, 43 CFR 3425, and BLM Handbook H-3420-1 (Competitive Coal Leasing).

Department of Justice Consultation

After the competitive coal lease sale, but prior to issuance of the lease, the BLM will solicit the opinion of the Department of Justice on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws. The Department of Justice is allowed 30 days to make this determination. If the Department of Justice has not responded in writing within the 30 days, the BLM can proceed with issuance of the lease.

2.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and alternatives to this action. The Proposed Action is to hold a competitive lease sale and issue a lease for the federal coal lands in the North Jacobs Ranch LBA Tract as applied for by JRCC[1]. Under this alternative, it is assumed that the tract would be developed as a maintenance tract for an existing mine. The No Action Alternative (Alternative 1) is to reject the North Jacobs Ranch lease application. Under this alternative, the North Jacobs Ranch LBA tract would not be offered for sale at this time. Other alternatives considered include:

- holding a competitive lease sale and issuing a lease for federal coal lands included in the North Jacobs Ranch LBA Tract as modified by the BLM, with the assumption that it would be developed as a maintenance tract for an existing mine (Alternatives 2 and 3 evaluate two alternate tract configurations being considered by BLM);
- holding a competitive lease sale and issuing a lease for federal coal lands included in the North Jacobs Ranch LBA Tract (as applied for or as modified by BLM), with the assumption that it would be developed as a new mine (Alternative 4);
- holding a competitive lease sale and issuing a lease for the federal coal lands in an expanded tract configured to include the North Jacobs Ranch Tract and all of the proposed State Section LBA Tract, with the assumption that the expanded tract could be developed as either a maintenance tract or as a new mine (Alternative 5); and
- delaying the sale of the North Jacobs Ranch LBA Tract as applied for until PRB coal prices rise and/or to allow recovery of the potential CBM resources in the tract prior to mining. Under this alternative, it is assumed that the tract could be developed as a maintenance tract or a new start mine, depending on how long the sale was delayed (Under Alternative 6).

The North Jacobs Ranch LBA Tract as applied for (Proposed Action) and as it might be amended by BLM (Alternatives 2 and 3) are shown in Figure 2-1.

LBA tracts are nominated for leasing by companies with an interest in acquiring them, but as discussed in Chapter 1, the LBA process is, by law and regulation, an open, public, competitive sealed-bid process. If the decision reached after this EIS is completed is to hold a lease sale, the applicant (JRCC) may or may not be

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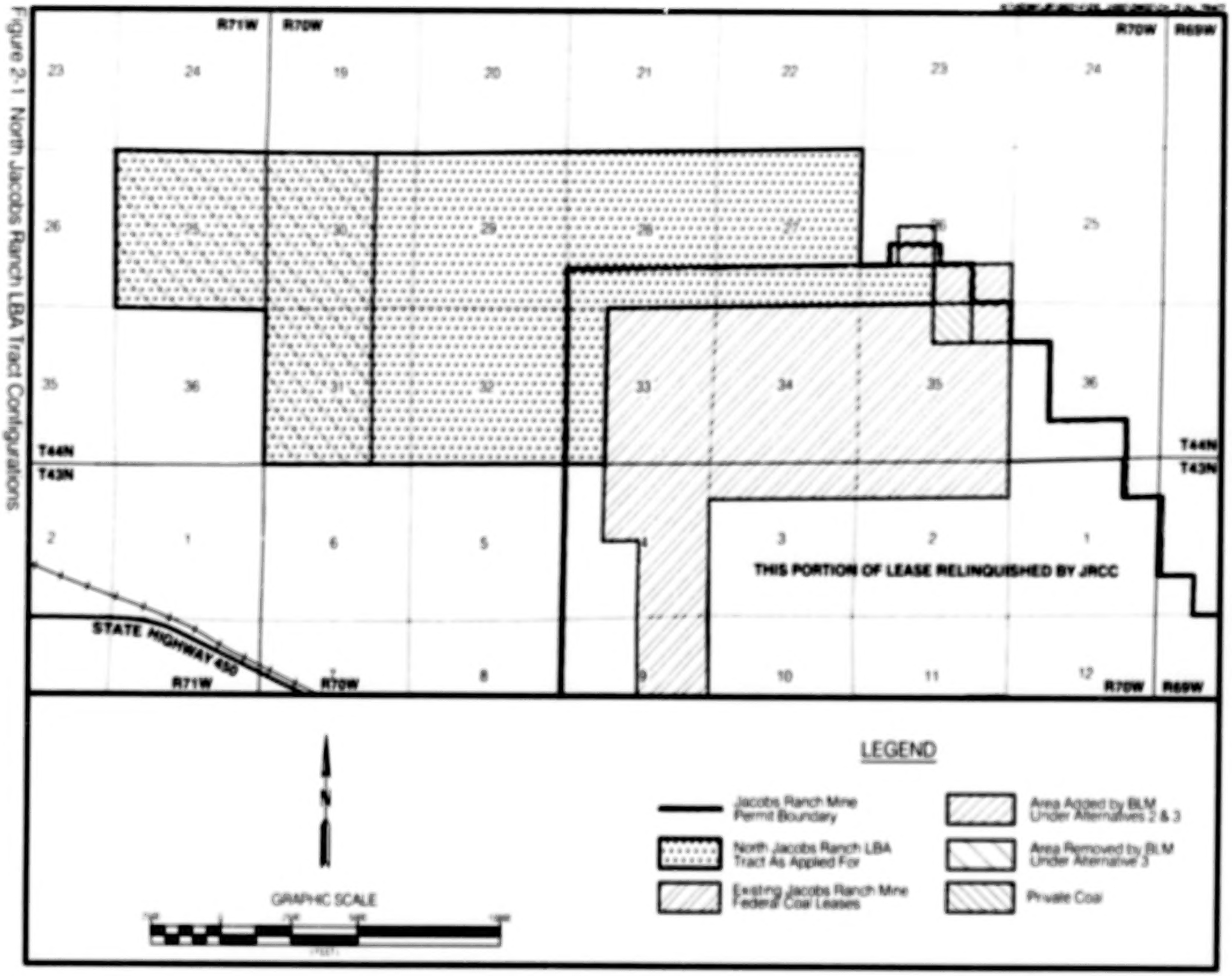
[1] Refer to page vii for a list of abbreviations and acronyms used in this document.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R71W
R70W
R70W
R69W
N
GRAPHIC SCALE
(FEET)
LEGEND
Jacobs Ranch Mine Permit Boundary
North Jacobs Ranch LBA Tract As Applied For
Existing Jacobs Ranch Mine Federal Coal Leases
Area Added by BLM Under Alternatives 2 & 3
Area Removed by BLM Under Alternative 3
Private Coal

Figure 2-1 North Jacobs Ranch LBA Tract Configurations

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the high bidder. The Proposed Action and Alternatives 2 and 3 considered in this EIS assume that JRCC would be the successful bidder if a competitive sale is held, and that the North Jacobs Ranch LBA Tract would be mined as a maintenance tract for the permitted Jacobs Ranch Mine. Alternative 4 assumes that JRCC would not be the successful bidder if a competitive sale is held, and that the North Jacobs Ranch LBA Tract would be developed as a new mine. Alternatives 5 and 6 assume that the tract could be developed as either a maintenance tract for an existing mine or as a new start mine.

The North Jacobs Ranch LBA Tract is also located adjacent to the Black Thunder Mine, operated by TBCC, a subsidiary of Arch Coal, Inc. TBCC is also in a position to mine the North Jacobs Ranch LBA Tract as a maintenance lease. If TBCC acquires the tract, the rate of coal production, mining sequence, equipment, and facilities would be different than if JRCC acquired the tract as a maintenance lease. However, if TBCC mined the tract, the area of disturbance and the impacts of removing the coal would not be significantly different from the area of disturbance and the impacts of JRCC mining the tract.

If a decision is made to hold a competitive lease sale and there is a successful bidder, a detailed mining and reclamation plan must be developed by the successful bidder and approved before mining can begin on the tract. As part of the approval process, the mining and reclamation plan would undergo detailed review by state and federal agencies. This plan could potentially differ from the plan used to analyze the impacts of the Proposed Action and Alternatives 2 and 3 in this EIS, but the differences would not be expected to significantly change the impacts described here. These differences would typically be related to the details of mining and reclaiming the tract but major factors like tons of coal mined, yards of overburden removed, acres disturbed, etc. would not be significantly different from the plan used in this analysis.

BLM and the State of Wyoming have approved applications to drill CBM wells on oil and gas leases inside the North Jacobs Ranch LBA tract. This approach is consistent with BLM's recently issued policy on conflicts between coal and CBM development, which is explained in BLM Instruction Memorandum No. 2000-081. BLM's policy is to optimize the recovery of both resources and ensure that the public receives a reasonable return. See Section 3.11 for information about existing and proposed CBM development under the different alternatives.

2.1 Proposed Action

Under the Proposed Action, the North Jacobs Ranch LBA Tract, as applied for by JRCC, would be offered for lease at a competitive sale, subject to standard and special lease stipulations developed for the PRB (Appendix D). The boundaries of the tract would be consistent with the tract configurations proposed in the North Jacobs Ranch LBA Tract lease application (see Figure 2-1). The Proposed Action assumes that JRCC will be the successful bidder on the North Jacobs Ranch Tract if it is offered for sale.

The legal description of the proposed North Jacobs Ranch LBA Tract coal lease lands as applied for by JRCC under the Proposed Action is as follows:

T.44N., R.70W., 6th P.M., Campbell County, Wyoming

Section 26: Lots 9 and 10; 80.38 acres
Section 27: Lots 1 through 16; 651.34 acres
Section 28: Lots 1 through 16; 655.23 acres
Section 29: Lots 1 through 16; 650.51 acres
Section 30: Lots 5 and 20; 652.74 acres
Section 31: Lots 5 through 20; 647.85 acres
Section 32: Lots 1 through 16; 669.97 acres
Section 33: Lots 4, 5, 12, 13 ; 161.19 acres

T.44N., R.71W., 6th P.M., Campbell County, Wyoming

Section 25: Lots 1 through 16; 651.98 acres

Total surface area applied for: 4,821.19 acres

Land descriptions and acreage are based on the BLM Status of Public Domain Land and Mineral Title approved Coal Plat as of March 7, 2000.

As indicated in Chapter 1, Section 1.4, no lands in the North Jacobs Ranch LBA Tract were found to be unsuitable for mining. The tract as applied for includes approximately 4,821.19 mineable acres. JRCC estimates that it includes approximately 519 million tons of mineable coal, and that about 467.1 million tons of that coal would be recoverable assuming a recovery factor of 90 percent. BLM will independently evaluate the volume and average quality of the coal resources included in the tract as part of the fair market value determination process. BLM's estimate of the mineable reserves and average quality of the coal included in the tract will be published in the sale notice if the tract is offered for sale. Some coal quality information in the area of the North Jacobs Ranch LBA Tract is included in Section 3.3 of this document. The approved Jacobs Ranch Mine Permit 271 Term T4 includes monitoring and mitigation measures for the Jacobs Ranch Mine that are required by SMCRA and Wyoming State Law. If the North Jacobs Ranch LBA tract is acquired by JRCC, these monitoring and mitigation measures would be included in the mine permit revision that must be approved before the North Jacobs Ranch LBA could be mined. These monitoring and mitigation measures are considered to be part of the Proposed Action and other action alternatives during the leasing process because they are regulatory requirements.

The North Jacobs Ranch LBA Tract would be mined as an integral part of the Jacobs Ranch Mine under the Proposed Action. The Jacobs Ranch Mine is already operating under both an approved state mining permit and an MLA mining plan. Both the existing approved state mining permit and MLA mining plan would require amendment to include the LBA tract. Since the North Jacobs Ranch LBA Tract would be an extension of the existing Jacobs Ranch Mine, the facilities and infrastructure would be the same as those identified in the WDEQ/LQD Mine Permit 271 Term T4 approved August 31, 1999 for the Jacobs Ranch Mine and the BLM Resource Recovery and Protection Plan approved March 31, 1999 for the Jacobs Ranch Mine.

JRCC's currently approved air quality permit from the WDEQ/AQD allows up to 38 million tons of coal per year to be mined through year 2001, and up to 50 million tons per year in 2002 through 200[illegible]. In 1999, the Jacobs Ranch Mine produced 29.1 million tons (Wyoming State Inspector of Mines 2000). Under the No Action Alternative, the Jacobs Ranch Mine would mine its remaining 203.3 million tons of recoverable leased coal reserves in approximately 6.7 years at an average annual production rate of 30 million tons per year. Under the Proposed Action, average annual production would increase by 9 million tons to 39 million tons per year, and the life of the existing mine would be extended by approximately 12.3 years.

If JRCC acquires the North Jacobs Ranch LBA Tract as applied for, they estimate that a total of 670.4 million tons of coal would be mined after January 1, 2000, with an estimated 467.1 million tons coming from the LBA Tract. This estimate of recoverable reserves assumes that about ten percent of the coal would be lost under normal mining practices, based on historical recovery factors at the Jacobs Ranch Mine. As of December 31, 1999, 349.9 million tons of coal had been mined from within the current permitted area of the mine.

Topsoil removal with heavy equipment would proceed ahead of overburden removal. Whenever possible, direct haulage to a reclamation area would be done, but due to scheduling, some topsoil would be temporarily stockpiled. As required by the reclamation plan, heavy equipment again will be used to haul and distribute the stockpiled topsoil.

The Jacobs Ranch Mine is one of several coal mines currently operating in the PRB where the coal seams are notably thick and the overburden is relatively thin. The truck-shovel mining method has to date been the sole means of overburden stripping and coal mining at the Jacobs Ranch Mine. The overburden is excavated and loaded into trucks by electric-powered shovels. Overburden would be removed within the North Jacobs Ranch LBA Tract by dragline and/or truck-shovel operations. Most overburden and all coal would be drilled and blasted to facilitate efficient excavation. As overburden is removed, most would be directly placed into areas where coal has already been removed. Elevations consistent with an approved PMT plan will be established as quickly as possible. Under certain conditions, the PMT may not be immediately achievable. This would occur when there is an excess of material which may require temporary stockpiling; when there is insufficient material available from current overburden removal operations; or when future mining could redisturb an area already mined.

Coal would be produced from three coal seams, the Upper, Middle and Lower Wyodak, at several working faces to enable blending of the coal to meet customer quality requirements, to comply with BLM lease requirements for maximum economic recovery of the coal resource, and to optimize coal removal efficiency with available equipment. There are three existing crushing facilities within the Jacobs Ranch Mine permit area that provide the capacity to produce the permitted level. The three facilities employ one-stage crushing to size the coal to a nominal 2-inch product. There are a total of seven storage silos. While sufficient capacity exists, future facilities may be constructed to improve operating efficiency and air quality protection. JRCC has an approved air quality permit from the WDEQ/AQD which allows production of 38 million tons of coal per year through 2001, and 50 million tons per year in 2002 through 2004.

Current employment at the Jacobs Ranch Mine is 350. If the LBA tract is acquired, JRCC anticipates that production would increase by 9 million tons per year to 39 mmtpy, with employment increasing by 18 to 368 persons.

Hazardous and Solid Waste

Solid waste which is produced at the existing Jacobs Ranch Mine consists of floor sweepings, shop rags, lubricant containers, welding rod ends, metal shavings, worn tires, packing material, used filters, and office and food wastes. Jacobs Ranch Mine disposes of its solid wastes within its permit boundary in accordance with WDEQ-approved solid waste disposal plans. Sewage is handled by WDEQ-permitted sewage systems present on the existing mine facilities. Maintenance and lubrication of most of the equipment takes place at existing shop facilities at the Jacobs Ranch Mine.

Major lubrication, oil changes, etc., of most equipment are performed inside the service building lube bays, where waste oil is currently contained and deposited in storage tanks. All of the collected waste oils are then disposed of by mixing them with fuel oil and ammonium nitrate to produce ANFO, the principle blasting agent used at the Jacobs Ranch Mine. These practices would not change if JRCC acquires the North Jacobs Ranch Tract.

JRCC has reviewed the EPA's *Consolidated List of Chemicals Subject to Reporting Under Title III of the*

Superfund Amendments and Reauthorization Act (SARA) *of 1986* (as amended) and EPA's *List of Extremely Hazardous Substances* as defined in 40 CFR 355 (as amended) for hazardous substances used at the Jacobs Ranch Mine. JRCC maintains files containing Material Safety Data Sheets for all chemicals, compounds and/or substances which are or would be used during the course of mining.

JRCC is responsible for ensuring that all production, use, storage, transport, and disposal of hazardous and extremely hazardous materials as a result of mining are in accordance with all applicable existing or hereafter promulgated federal, state, and local government rules, regulations, and guidelines. All mining activities involving the production, use, and/or disposal of hazardous or extremely hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

JRCC must comply with emergency reporting requirements for releases of hazardous materials. Any release of hazardous or extremely hazardous substances in excess of the reportable quantity, as established in 40 CFR 117, is reported as required by the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended. The materials for which such notification must be given are the extremely hazardous substances listed in Section 302 of the *Emergency Planning and Community Right to Know Act* and the hazardous substances designated under Section 102 of CERCLA, as amended. If a reportable quantity of a hazardous or extremely hazardous substance is released, immediate notice must be given to the WDEQ Solid and Hazardous Waste Division and all other appropriate federal and state agencies.

Each mining company is expected to prepare and implement several plans and/or policies to ensure environmental protection from hazardous and extremely hazardous materials. These plans/policies include:

- Spill Prevention Control and Countermeasure Plans;

- Spill Response Plans;

- Inventories of Hazardous Chemical Categories Pursuant to Section 312 of SARA, as Amended; and

- Emergency Response Plans.

All mining operations are also required to be in compliance with regulations promulgated under the Resource Conservation and Recovery Act, Federal Water Pollution Control Act (Clean Water Act), Safe Drinking Water Act, Toxic Substances Control Act, Mine Safety and Health Act, and the Federal Clean Air Act. In addition, mining operations must comply with all attendant state rules and regulations relating to hazardous material reporting, transportation, management, and disposal.

Compliance with these rules is the current practice at Jacobs Ranch Mine. Acquisition of the North Jacobs Ranch LBA Tract by JRCC would not change these current practices nor the amount or type of any wastes generated or disposed at the mine, although quantities of some wastes would increase in proportion to anticipated increases in coal production (e.g., fuel, lubricants, and shop and office wastes).

2.2 Alternative 1

Alternative 1 is the No-Action Alternative. Under the No-Action Alternative, JRCC's coal lease application would be rejected, the North Jacobs Ranch LBA Tract would not be offered for competitive sale, and the coal contained within the tract would not be mined. Rejection of the application would not affect permitted mining activities on existing leases at the adjacent Jacobs Ranch and Black Thunder Mines. Approximately 6,955 acres are currently leased at the Jacobs Ranch Mine and about 8,122 acres will eventually be affected. Under the No-Action Alternative, average annual production at the Jacobs Ranch Mine will probably not exceed 30 mmtpy, and average employment will remain at 350 persons. Approved mining activities and employment will also continue at the Black Thunder Mine. Portions of the surface of the LBA Tract would probably be disturbed due to overstripping to allow coal to be removed from existing, contiguous leases at both the Black Thunder and Jacobs Ranch Mines.

In order to compare the economic and environmental consequences of mining these lands versus not mining them, this EIS analysis was prepared under the assumption that the North Jacobs Ranch LBA Tract would not be mined in the foreseeable future if the No-Action Alternative is selected. However, selection of this alternative would not preclude leasing and mining of this tract in the future, as either a maintenance tract for an existing operation or as a new start mine.

2.3 Alternative 2

BLM is considering an alternate tract configuration for the North Jacobs Ranch LBA Tract in order to minimize the risk of bypassing federal coal that would potentially become economically unrecoverable if it is not included in this tract. As part of the preliminary geologic analysis of the federal coal resources in and around the North Jacobs Ranch LBA Tract, the BLM identified unleased federal coal east of the tract as applied for that might be bypassed if it is not included in the tract. The lands that BLM is considering adding to the tract are:

T.44N., R.70W., 6th P.M., Campbell County, Wyoming

Section 26: Lots 8, 11 and 12;
120.69 acres
Section 35: Lot 1
40.36 acres

Total: 161.05 acres

These 161.05 acres contain approximately 4 million tons of mineable coal. The Alternative 2 reconfiguration, therefore, results in a tract comprising 4,982.24 acres containing approximately 523 million tons of mineable coal, according to information provided by the applicant. Using JRCC's projected recovery factor of 90 percent, the reconfigured tract would contain about 471 million tons of recoverable coal.

Under Alternative 2, it is assumed that the tract would be developed as a maintenance tract for an existing mine. Other assumptions would be the same as for the Proposed Action.

2.4 Alternative 3

Under Alternative 3, the BLM would hold a competitive lease sale for federal coal lands in a tract configured by BLM to minimize conflicts with existing and proposed oil and gas wells, minimize the risk of bypassing federal coal that would potentially become economically unrecoverable, and potentially enhance the fair market value of the coal included in the reconfigured tract as well as the unleased federal coal outside of the reconfigured tract. Based on a preliminary consideration of conventional oil and gas and CBM potential and potential fair market value considerations, this alternative tract configuration would include the following lands:

T.44N., R.70W., 6th P.M., Campbell County, Wyoming
Section 26: Lots 8 through 12; 201.07 acres
Section 27: Lots 1 through 16; 651.34 acres
Section 28: Lots 1 through 16; 655.23 acres
Section 29: Lots 1 through 16; 650.51acres
Section 30: Lots 5, 12, 13, 20; 166.06 acres
Section 31: Lots 5, 12, 13, 20; 166.85 acres
Section 32: Lots 1 through 16; 669.97 acres
Section 33: Lots 4, 5, 12, 13; 162.19 acres
Section 35: Lot 1; 40.36 acres

Total: 3,363.58 acres

The following lands included in the Proposed Action and Alternative 2 would not be included in Alternative 3:

T.44N., R.70W.
Section 30: Lots 6 through 11, and 14 through 19; 486.68 acres
Section 31: Lots 6 through 11, and 14 through 19; 481.00 acres
T.44N., R71W.
Section 25: Lots 1 through 16; 651.98 acres

Total: 1,619.66 acres

The original configuration of the North Jacobs Ranch LBA Tract as applied for in the Proposed Action would be further reconfigured by adding the adjacent 161.05 acres of unleased federal coal in Sections 26 and 35, T.44N., R.70W. (as described in Section 2.3).

The Alternative 3 reconfiguration results in a tract comprising 3,363.58 acres containing approximately 317 million tons of mineable coal according to the information provided by the applicant. Using JRCC's projected recovery factor of 90 percent, the reconfigured tract would contain about 285.3 million tons of recoverable coal. The net decrease to the North Jacobs Ranch LBA Tract as applied for would be 1,458.61 acres containing approximately 202 million tons of mineable coal.

The portion of the tract as applied for that is not included in the Alternative 3 configuration would be available for consideration for leasing in the future. At a later date, the conflicts would potentially be reduced by allowing increased time for the development of the CBM resources prior to mining and continuing the recovery of the conventional oil and gas reserves.

Under Alternative 3, it is assumed that the tract would be developed as a maintenance tract for an existing mine. Other assumptions would also be the same as for the Proposed Action.

2.5 Alternatives Considered but Not Analyzed in Detail

2.5.1 Alternative 4

Under this alternative, as under the Proposed Action and Alternatives 2 and 3, the BLM would hold a competitive, sealed-bid sale for the lands included in the North Jacobs Ranch LBA Tract. Alternative 4 assumes, however, that the successful qualified bidder would be someone other than the applicant and that this bidder would plan to open a new mine to develop the coal resources in the North Jacobs Ranch LBA Tract.

The tract under the Proposed Action and Alternatives 2 or 3 potentially includes sufficient coal resources to support a new mine. If a competitive coal sale is held, the successful bidder on the tract could potentially be a party who proposes to start a new coal mine.

This alternative is not analyzed in detail in this EIS. A company acquiring this coal for a new stand-alone mine would require considerable initial capital expenses, including the construction of new surface facilities (i.e., offices, shops, warehouses, coal processing facilities, coal loadout facilities, and rail spur), extensive baseline data collection, and development of a mining and reclamation plan. In addition, a company acquiring this coal for a new start mine would have to compete for customers with established mines in a competitive market that is currently characterized by low prices and production cutbacks by existing mines. Development of a new mine on this tract under today's economic climate is considered unlikely.

The environmental impacts of developing a new mine to recover the coal resources in the LBA Tract would be greater than under the Proposed Action, the No Action Alternative, or Alternatives 2 and 3 because of the need for new facilities, a new rail line, new employment, and the creation of additional sources of dust. In the event that a lease sale is held and the applicant is not the successful bidder, the successful bidder would be required to submit a detailed mining and reclamation plan for approval before the tract could be mined, and this NEPA analysis would be reviewed and supplemented as necessary prior to approval of that mining and reclamation plan.

2.5.2 Alternative 5

Under Alternative 5, the BLM would hold a competitive lease sale for the federal coal lands in an expanded tract configured to include the North Jacobs Ranch Tract and all of the State Section LBA. Evergreen Enterprises applied for the State Section LBA tract on January 31, 2000. Evergreen Enterprises had applied for a similar tract, the New Keeline Tract, in 1996. The BLM rejected the New Keeline application in 1997.

The New Keeline LBA Tract and the State Section LBA tract both include most of the area applied for by JRCC in the North Jacobs Ranch tract, but both also include additional federal coal resources north of the North Jacobs Ranch LBA Tract (See Figure 1-1), which represent about 3,750 additional acres and approximately 193 million additional tons of federal coal. Evergreen Enterprises withdrew the appeal on the New Keeline LBA rejection and their application for the State Section LBA Tract in September 2000.

This alternative was evaluated by BLM prior to the withdrawal of the State Section LBA Tract by the applicant. Under this alternative, it is assumed that the tract could be developed as either a maintenance tract or as a new start mine. The enlarged tract would include sufficient coal resources that a new start mine could be opened. If a competitive coal sale is held, the successful bidder on the tract could be one of the adjacent existing mines, or the bidder could potentially be a party who proposes to start a new coal mine.

The North Jacobs Ranch LBA Tract as applied for includes sufficient coal resources (519 million tons) to justify the expense of starting a new mine. If it is offered for competitive sale, Evergreen Enterprises or another party could submit a bid on the tract as applied for and acquire it, if they submit the highest bid that meets or exceed the fair market value as determined by BLM. The acreage added to the North Jacobs Ranch LBA tract under this alternative could be applied for in the future as a maintenance tract.

Leasing the State Section LBA Tract at this time could potentially reduce the per ton fair market value of the federal coal included in the tract. The State Section LBA tract as applied for includes approximately 712.1 million tons of mineable coal which Evergreen Enterprises proposed to mine at a rate of 12 to 15 million tons per year, for an estimated mine life of 35 years. If this coal was mined at a rate of 39 million tons per year, as proposed by the Jacobs Ranch Mine, the estimated time to mine the entire tract would be about 18 years. The fact that some of the coal would not be mined for a number of years reduces the current fair market value of that coal because its estimated value in the future, when it would be mined, must be discounted to the present to determine its current fair market value. The current fair market value of a federal coal tract being offered for lease is an average of the estimated fair market value of all of the coal included in the tract, and adding coal that has a small present value to a tract reduces the per ton value of all the coal in the tract.

The coal that is included in the State Section Tract, but is outside of the North Jacobs Ranch LBA Tract under the Proposed Action, could be combined with other unleased federal coal to the west and north in an application in the future, when it has more immediate mining potential and a higher fair market value as a result. Since adding additional coal to the tract as applied for could, under current market conditions, potentially reduce the per ton fair market value of the federal coal included in the tract, this alternative was not analyzed in detail.

The environmental impacts of mining the State Section LBA tract as part of an existing mine would be expected to be similar and about equal to the Proposed Action, Alternative 2 or Alternative 3, although mine life would be extended for a longer period of time. If a new mine start is required to mine the coal, the environmental impacts would be expected to be greater than if it were mined as an extension of an existing mine.

2.5.3 Alternative 6

Under Alternative 6, the BLM would delay the sale of the North Jacobs Ranch LBA Tract as applied for until PRB coal prices rise and/or to allow recovery of the potential CBM resources in the tract prior to mining. Under this alternative, it is assumed that the tract could be developed as a maintenance tract or a new start mine, depending on how long the sale was delayed.

There are two major sources of revenue to state and federal governments from the leasing and mining of federal coal: 1) the competitive bonus bid paid at the time the coal is leased, and 2) a 12.5 percent royalty collected when the coal is sold. This alternative could potentially increase the fair market value of the coal resources in the LBA tract, which could increase the bonus bid when the coal is leased. However, the price paid for coal from northeastern Wyoming has decreased by more than $1.00 per ton since 1992, while production of low sulfur PRB coal has increased by more than ten percent annually since 1992. Thus there is no assurance that delaying the sale would result in a higher coal price.

The fair market value of the tract and the resulting bonus payment to the government could increase if a lease sale is postponed until PRB coal prices rise, but the postponement would not necessarily lead to higher royalty income to the state or federal governments. Royalty payments are the larger of the two revenue sources. They increase automatically when coal prices increase because they are collected at the time the coal is sold, but they cannot be collected until the coal is leased and permitted and that takes several years. If leasing does not occur until prices rise, then by the time the coal is mined, the higher coal prices may or may not have persisted. If the coal is already leased when prices increase, higher royalty payments will be collected immediately and the coal lessee may be able to negotiate longer term contracts at higher prices, which would result in longer term, higher royalty payments. On the other hand, if the existing mining operation runs out of coal reserves before prices rise, they may have to shut down their operations before additional coal can be leased and permitted for mining. In that case, the fair market value of the coal may actually drop because the added expense of reopening a mine or starting a new mine would have to be factored into the fair market value.

Other considerations include the value of leaving the mineable coal for future development versus the value of making low-sulfur coal available now, in anticipation of cleaner fuel sources being developed in the future. Continued leasing of PRB coal enables coal-fired power plants to meet Clean Air Act requirements without constructing new plants, revamping existing plants, or switching to existing alternative fuels, which would probably significantly increase power costs for individuals and businesses. If cleaner fuel sources are developed in the future, they could be phased in with less economic impact to the public.

A range of the potential future economic benefits of delaying leasing until coal prices rise could be quantified in an economic analysis, but the benefits would have to be discounted to the present, which would make this alternative less attractive now.

BLM and the State of Wyoming have approved applications to drill CBM wells on oil and gas leases inside the North Jacobs Ranch LBA tract. If the North Jacobs Ranch LBA Tract is leased, mining can not occur until the lessee has an approved mining and reclamation permit and MLA mining plan, which may take several years. This allows time for CBM resources to be recovered from the tract.

The environmental impacts of mining the coal at a later time as part of an existing mine would be expected to be similar and about equal to the Proposed Action, Alternative 2 or Alternative 3. If a new mine start is required to mine the coal, the environmental impacts would be expected to be greater than if it were mined as an extension of an existing mine.

2.6 Comparison of Alternatives

The locations of the Proposed Action and Alternatives 2 and 3 for the North

Jacobs Ranch LBA Tract are shown on Figure 2-1. A summary comparison of coal production, surface disturbance, mine life, and projected federal and state revenues for the Proposed Action and Alternatives 1, 2 and 3 for the North Jacobs Ranch LBA Tract is presented in Table 2-1.

Table 2-2 presents a comparative summary of the direct and indirect environmental impacts of implementing each alternative as compared to the No-Action Alternative. The No-Action Alternative assumes completion of currently permitted mining at the Jacobs Ranch Mine for comparison to the North Jacobs Ranch LBA Tract. Table 2-3 presents a comparative summary of cumulative environmental impacts of implementing each alternative. The environmental consequences of the Proposed Action and alternatives are analyzed in Chapter 4.0.

These summary impact tables are derived from the following explanation of impacts and magnitude. NEPA requires all agencies of the federal government to include, in every recommendation or report on proposals for legislation and other major federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on:

(i) the environmental impact of the Proposed Action,
(ii) any adverse environmental effects which cannot be avoided should the proposal be implemented,
(iii) alternatives to the Proposed Action,
(iv) the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and
(v) any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented (42 USC § 4332[C]).

Impacts can be beneficial or adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation) or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

Table 2-1. Summary Comparison of Coal Production, Surface Disturbance, and Mine Life for North Jacobs Ranch LBA Tract and Jacobs Ranch Mine

Item	No Action Alternative (Existing Jacobs Ranch Mine)	Added by Proposed Action	Added by Alternative 2	Added by Alternative 3
Mineable Coal (as of 1/1/00)	225.9 mmt	519 mmt	523 mmt	317 mmt
Recoverable Coal (as of 1/1/00)[1]	203.3 mmt	467.1 mmt	471 mmt	285.3 mmt
Coal Mined Through 1999	349.9 mmt	---	---	---
Lease Acres[2]	6,955 ac	4,821.19 ac	4,982.24 ac	3,363.58 ac
Total Area To Be Disturbed[2]	8,122 ac	5,364 ac	5,465 ac	3,689 ac
Permit Area[2]	9,283.78 ac	6,110 ac	6,205 ac	4,131 ac
Average Annual Post-1999 Coal Production	30 mmt	9 mmt	9 mmt	9 mmt
Remaining Life Of Mine (post-1999)	6.7 yrs	12.3 yrs	12.1 yrs	7.6 yrs
Average No. of Employees	350	18	18	18
Total Projected State Revenues (post-1999)[3]	$ 223.6 million	$ 513.8 million	$ 517.8 million	$ 313.8 million
Total Projected Federal Revenues (post-1999)[4]	$ 75.7 million	$ 173.9 million	$ 175.1 million	$ 106.2 million

Footnotes:

[1] Assumes 90 percent recovery of leased coal.

[2] For the Proposed Action and Alternatives 2 and 3, the disturbed acreage exceeds the leased acreage because of the need for highwall reduction, topsoil removal and other activities outside the lease boundaries. The permit area is larger than leased or disturbed areas to assure that all disturbed lands are within the permit boundary and to allow easily defined legal land description.

[3] Projected revenue to the State of Wyoming is $1.10 per ton of coal sold and includes income from severance tax, property and production taxes, sales and use taxes, and Wyoming's share of federal royalty payments (University of Wyoming 1994).

[4] Federal revenues based on $4.00 per ton price x federal royalty of 12.5 percent x amount of recoverable coal plus bonus payment on LBA coal of $0.22 per ton based on average of last nine LBA's (Table 1-1) x amount of leased coal less state's 50 percent share.

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Table 2-2. Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, Alternative 3 and the No-Action Alternative for the North Jacobs Ranch LBA Tract[2]

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 & ALTERNATIVE 3**
TOPOGRAPHY & PHYSIOGRAPHY		
PERMANENT TOPOGRAPHIC MODERATION could result in:		
Microhabitat reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Habitat diversity reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in water runoff and peak flows	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Increased precipitation infiltration	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Wildlife carrying capacity reduction	Moderate, possibly short term on existing mine area	Same as No Action on expanded mine area
Reduction in erosion	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Enhanced vegetative productivity	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Potential acceleration of groundwater recharge	Moderate, long term on existing mine area	Same as No Action on expanded mine area
GEOLOGY AND MINERALS		
SUBSURFACE changes would result in:		
Removal of coal	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Removal and replacement of topsoil and overburden	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Physical characteristic alterations in geology	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of coal bed methane	Moderate, permanent on existing mine area	Same as No Action on expanded mine area
SOILS		
CHANGES IN PHYSICAL PROPERTIES would include:		
Increased near-surface bulk density	Moderate, long term on existing mine area	Same as No Action on expanded mine area
More uniformity in soil type, thickness, and texture	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Increased uniformity in mixed soils (e.g., texture)	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
Decreased soil loss due to topographic modification	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
CHANGES IN CHEMICAL PROPERTIES would include:		
Uniform soil nutrient distribution	Moderate, beneficial, long term on existing mine area	Same as No Action on expanded mine area
CHANGES IN BIOLOGICAL PROPERTIES would include:		
Organic matter reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Microorganism population reduction	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Existing plant habitat reduction in soils stockpiled before placement	Moderate, long term on existing mine area	Same as No Action on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, Alternative 3 and the No-Action Alternative for the North Jacobs Ranch LBA Tract[2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 & ALTERNATIVE 3**
AIR QUALITY		
IMPACTS ASSOCIATED WITH MINING OPERATIONS would include:		
Elevated concentrations of TSP	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Elevated concentrations of gaseous emissions	Negligible, short term on existing mine area	Moderate short term on expanded mine area
WATER RESOURCES		
SURFACE WATER		
CHANGES IN RUNOFF CHARACTERISTICS AND SEDIMENT DISCHARGE include the following:		
Disruption of surface drainage systems	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased runoff and erosion rates	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased infiltration	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Reduction in peak flows	Moderate, long term on existing mine area	Same as No Action on expanded mine area
GROUNDWATER		
GROUNDWATER RESOURCE IMPACT would include the following:		
Removal of coal and overburden aquifers	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Replacement of existing coal and overburden with spoil aquifers	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Depressed water levels in aquifers adjacent to mines	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Change in hydraulic properties	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Change in groundwater quality in backfilled areas	Moderate, long term on existing mine area	Same as No Action on expanded mine area
ALLUVIAL VALLEY FLOORS		
While a final determination has not been made by WDEQ/LQD, it is believed that there are no AVF's significant to agriculture on the proposed lease tract	No impact on existing mine area	Same as No Action on expanded mine area
WETLANDS		
Removal of all existing wetlands	Wetlands on existing mine areas would be mined and reclaimed	Same as No Action on expanded mine area
VEGETATION		
PROGRESSIVE REDUCTION IN NATIVE VEGETATION would result in:		
Increased erosion	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Wildlife and livestock habitat loss	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Wildlife habitat carrying capacity loss	Moderate, long term on existing mine area	Same as No Action on expanded mine area

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[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, Alternative 3 and the No-Action Alternative for the North Jacobs Ranch LBA Tract[2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 & ALTERNATIVE 3**
VEGETATION (Continued)		
AFTER RECLAMATION the following could result:		
Changes in surface water networks	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in vegetation diversity	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in shrub density	Negligible, long term on existing mine area	Same as No Action on expanded mine area
WILDLIFE		
DURING MINING the following could occur:		
Wildlife displacement	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Pronghorn passage reduction	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Increased mortality rate to small mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Temporary displacement of small mammals	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Sage grouse habitat removal	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Abandonment of raptor nests	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Foraging habitat reduction for raptors	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of nesting and foraging habitat for MBHFI	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Reduction in waterfowl resting and feeding habitat	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of songbird foraging habitat	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Temporary wildlife habitat loss	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Continued road kills by mine-related traffic	Negligible, short term on existing mine area	Same as No Action on expanded mine area
THREATENED, ENDANGERED AND CANDIDATE SPECIES		
MINING IMPACTS could result in the following:		
Loss of black-footed ferret colonies	No impacts on existing mine area	Same as No Action on expanded mine area
Loss of bald eagle nesting and foraging habitat	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Loss of peregrine falcon nesting and foraging habitat	No impact on existing mine area	Same as No Action on expanded mine area
Loss of Ute Ladies-tresses orchid habitat	Negligible on existing mine area	Same as No Action on expanded mine area
Loss of mountain plover habitat	Negligible on existing mine area	Same as No Action on expanded mine area
Loss of swift fox habitat	Negligible on existing mine area	Same as No Action on expanded mine area
LAND USE AND RECREATION		
ENVIRONMENTAL CONSEQUENCES ON LAND USE would be:		
Reduction of livestock grazing	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of wildlife habitat	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Curtailment of oil and gas development	Moderate, long term on existing mine area	Same as No Action on expanded mine area
Loss of public land available for recreation activities	Moderate, short term on existing mine area	Same as No Action on expanded mine area
Loss of coal bed methane reserves	Moderate, permanent on existing mine area	Same as No Action on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-2 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, Alternative 3 and the No-Action Alternative for the North Jacobs Ranch LBA Tract[2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 & ALTERNATIVE 3**
CULTURAL RESOURCES		
33 sites not eligible or recommended not eligible for NRHP 1 eligible for NRHP	Impacts to eligible or unevaluated sites are not permitted; any site eligible for the NRHP would be avoided or mitigated through data recovery	Same as No Action on expanded mine area
Possible increase in vandalism	No impacts on existing mine area	Negligible on expanded mine area
Possible increase in unauthorized collecting	No impacts on existing mine area	Negligible on expanded mine area
NATIVE AMERICAN CONCERNS	No impact identified on existing mine area	Same as No Action on expanded mine area
PALEONTOLOGICAL RESOURCES		
Overburden removal could expose fossils for scientific examination	No impact identified on existing mine area	Same as No Action on expanded mine area
VISUAL RESOURCES		
EVIDENT IMPACTS DURING MINING include the following:		
Alteration of landscape classified by the USFS as "common"	Negligible, short term on existing mine area	Same as No Action on expanded mine area
IMPACTS FOLLOWING RECLAMATION could be:		
Smoother sloped terrain	Negligible, long term on existing mine area	Same as No Action on expanded mine area
Reduction in sagebrush density	Negligible, short term on existing mine area	Same as No Action on expanded mine area
NOISE		
INCREASED NOISE LEVELS could affect:		
Nearby occupied dwellings	Negligible, short term on existing mine area	Same as No Action on expanded mine area
Wildlife in immediate vicinity	Negligible, short term on existing mine area	Same as No Action on expanded mine area
TRANSPORTATION FACILITIES		
Increase in duration that coal is shipped on railroads and employees travel on highways by 7.6 to 12.3 years	No impact on existing mine area	Negligible, short term on expanded mine area
Relocation of pipelines	No impact on existing mine area	Negligible, short term on expanded mine area
Relocation of utility lines	No impact on existing mine area	Same as No Action on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

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Table 2-2 Summary Comparison of Magnitude[1] and Duration of Direct and Indirect Impacts for the Proposed Action, Alternative 2, Alternative 3 and the No-Action Alternative for the North Jacobs Ranch LBA Tract[2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION, ALTERNATIVE 2 & ALTERNATIVE 3**
SOCIOECONOMICS EFFECTS DURING MINING would include:		
Employment Potential (Increase of up to 18 jobs in expanded mine area is expected)	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Revenues from royalties and taxes to the state government	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Revenues from royalties and taxes to the federal government	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Economic development	Moderate, beneficial short term on existing mine area	Increased moderate, beneficial, short term on expanded mine area
Population in Campbell and Converse counties	No impact on existing mine area	Negligible, short term on expanded mine area

[1] Refer to Section 4.0 and 4.1 for a discussion on magnitude of impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3. Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2]

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE TYPE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2 & ALTERATIVE 3**
TOPOGRAPHY & PHYSIOGRAPHY		
REDUCED RELIEF AND SUBDUED TOPOGRAPHY could result in:		
Reduction in topographic diversity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Increased precipitation infiltration	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Biodiversity reduction	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Big game carrying capacity reduction	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
GEOLOGY AND MINERALS		
RECOVERY OF COAL would result in:		
Stabilization of municipal, county and state economies	Significant, beneficial, short term on existing mine areas	Same as No Action on expanded mine areas
SOILS		
RECLAIMED SOILS could result in:		
Increased soil productivity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Reduced erosion	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
AIR QUALITY		
IMPACTS ASSOCIATED WITH MINING OPERATIONS would include:		
Elevated concentrations of TSP	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Elevated concentrations of gaseous emissions	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
WATER RESOURCES		
SURFACE WATER		
IMPACTS TO SURFACE WATER could result in:		
Temporary reduction in soil infiltration rates and increased runoff	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
GROUNDWATER		
IMPACTS ON GROUNDWATER could result in:		
Replacing coal and overburden aquifers with spoil aquifers	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
Drawdown in the coal and shallower aquifers in surrounding areas	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Water-level decline in the sub-coal Fort Union Formation	Negligible to moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Change in groundwater quality as a result of mining	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas

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[1] Refer to Section 4.5 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3 Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	MAGNITUDE TYPE AND DURATION OF IMPACT	
RESOURCE NAME	NO ACTION ALTERNATIVE	PROPOSED ACTION & ALTERNATIVE 2 & ALTERATIVE 3
ALLUVIAL VALLEY FLOORS	No cumulative impacts anticipated on existing mine areas	Same as No Action on expanded mine areas
WETLANDS		
Removal of existing wetlands	Wetlands on existing mine areas would be mined and reclaimed	Same as No Action on expanded mine areas
VEGETATION		
SURFACE DISTURBANCE would result in:		
Loss of common native vegetation types for wildlife	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Regional loss of vegetative diversity	Negligible, long term on existing mine areas	Same as No Action on expanded mine areas
WILDLIFE		
IMPACTS ON WILDLIFE FROM SURFACE MINING could result in:		
Loss of pronghorn habitat	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Mule deer population reduction	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in raptor nesting sites and foraging habitat	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in sage grouse leks	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Loss of nesting and foraging habitat for MBHFI	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction in waterfowl habitat	Minor, short term on existing mine areas	Same as No Action on expanded mine areas
Permanent reduction in wildlife habitat diversity	Major, long term on existing mine areas	Same as No Action on expanded mine areas
Permanent reduction in some wildlife carrying capacity	Major, long term on existing mine areas	Same as No Action on expanded mine areas
THREATENED, ENDANGERED AND CANDIDATE SPECIES		
No significant cumulative impacts to T & E species are projected	Negligible, short term on existing mine areas	Same as No Action on expanded mine areas
LAND USE AND RECREATION		
IMPACTS ON LAND USE could result in:		
Loss of agricultural production	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
Disruption of oil and gas development/production	Moderate to significant, short term on existing mine areas	Same as No Action on expanded mine areas
Reduction of wildlife habitat	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
IMPACTS ON RECREATION could result in:		
Loss of access to public lands used by recreationists, particularly hunting	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas

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[1] Refer to Section 4.5 for a discussion of cumulative impacts.

[2] All impacts are assumed to be adverse unless noted otherwise.

Table 2-3 Summary Comparison of Magnitude and Duration of Cumulative Impacts[1, 2] (Continued)

DESCRIPTION OF POTENTIAL IMPACT BY RESOURCE	***MAGNITUDE TYPE AND DURATION OF IMPACT***	
RESOURCE NAME	**NO ACTION ALTERNATIVE**	**PROPOSED ACTION & ALTERNATIVE 2 & ALTERATIVE 3**
CULTURAL RESOURCES	Sites eligible for NRHP would be mitigated on existing mine areas	Same as No Action on expanded mine areas
NATIVE AMERICAN CONCERNS	No impact identified on existing mine areas	Same as No Action on expanded mine areas
PALEONTOLOGICAL RESOURCES	No impact identified on existing mine areas	Same as No Action on expanded mine areas
VISUAL RESOURCES		
Impacts on visual resources by mining activities	Moderate, short term on existing mine areas	Same as No Action on expanded mine areas
NOISE	No impact anticipated outside of existing mine areas	Same as No Action outside expanded mine areas
TRANSPORTATION FACILITIES		
Continued use of existing transportation facilities	Negligible, short term on existing mine area	Same as No Action on expanded mine areas
SOCIOECONOMICS		
IMPACTS ON SOCIOECONOMICS could include:		
Mineral and energy related development	Moderate, beneficial, short term on existing mine areas	Same as No Action on expanded mine areas
Employment	Significant, beneficial, short term on existing mine areas	Same as No Action on expanded mine areas
Housing market	Significant, short term due to existing mines	Same as No Action on expanded mine areas
Economic development	Significant, beneficial, short term due to existing mine areas	Same as No Action on expanded mine areas
Revenues and royalties	Significant, beneficial, short term due to existing mine areas	Same as No Action on expanded mine areas

[1] Refer to Section 4.5 for a discussion of cumulative impacts.
[2] All impacts are assumed to be adverse unless noted otherwise.

3.0 AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the physical, biological, cultural, and socioeconomic resources in the study area. The resources that are addressed here were identified during the scoping process or interdisciplinary team review as having the potential to be affected. Figure 3-1 shows the general analysis area for most environmental resources.

Critical elements of the human environment (BLM[1] 1988) that could potentially be affected by the proposed actions include air quality, cultural resources, Native American religious concerns, T&E species, hazardous or solid wastes, water quality, wetlands/riparian zones, invasive non-native species and environmental justice. Five other critical elements (areas of critical environmental concern, prime or unique farmlands, floodplains, wild and scenic rivers, and wilderness) are not present in the project area and are not addressed further. In addition to the critical elements that are potentially present in the project area, this EIS discusses the status and potential effects of mining the LBA Tract on topography and physiography, geology and mineral resources, soils, water quantity, alluvial valley floors, vegetation, wildlife, land use and recreation, paleontological resources, visual resources, noise, transportation resources, and socioeconomics.

3.1 General Setting

The project area is located in the PRB, a part of the Northern Great Plains which includes most of northeastern Wyoming. Vegetation is primarily sagebrush and mixed grass prairie. The climate is semi-arid, with an average annual precipitation at Wright (Figure 3-1) of just over 11 inches (Martner 1986). June (2.35 inches) and May (2.04 inches) are the wettest months, and February (0.29 inch) is the driest. Snowfall averages 25.1 inches per year, with most occurring in March (5.0 inches) and December (4.5 inches). Potential evapotranspiration, at approximately 31 inches (National Oceanic and Atmospheric Administration 1969), exceeds annual precipitation. The average daily mean temperature is 44.2°F. The highest recorded temperature was 103°F and the lowest was -34°F. July is the warmest month, with a mean daily temperature of 70°F, and January is the coldest (20.5°F). The frost-free period is 100-125 days.

The average annual wind speed for the period 1987 through 1999 at the Jacobs Ranch Mine (Figure 3-1) was 8.9 mph. Wind speeds are highest in the winter and spring and are predominantly from the northwest and southeast. Winter gusts often reach 30-40 mph. During periods of strong wind, dust may impact air quality across the region.

There are an average of 15 air-stagnation events annually in the PRB with an average duration of two days each (BLM 1974). General

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

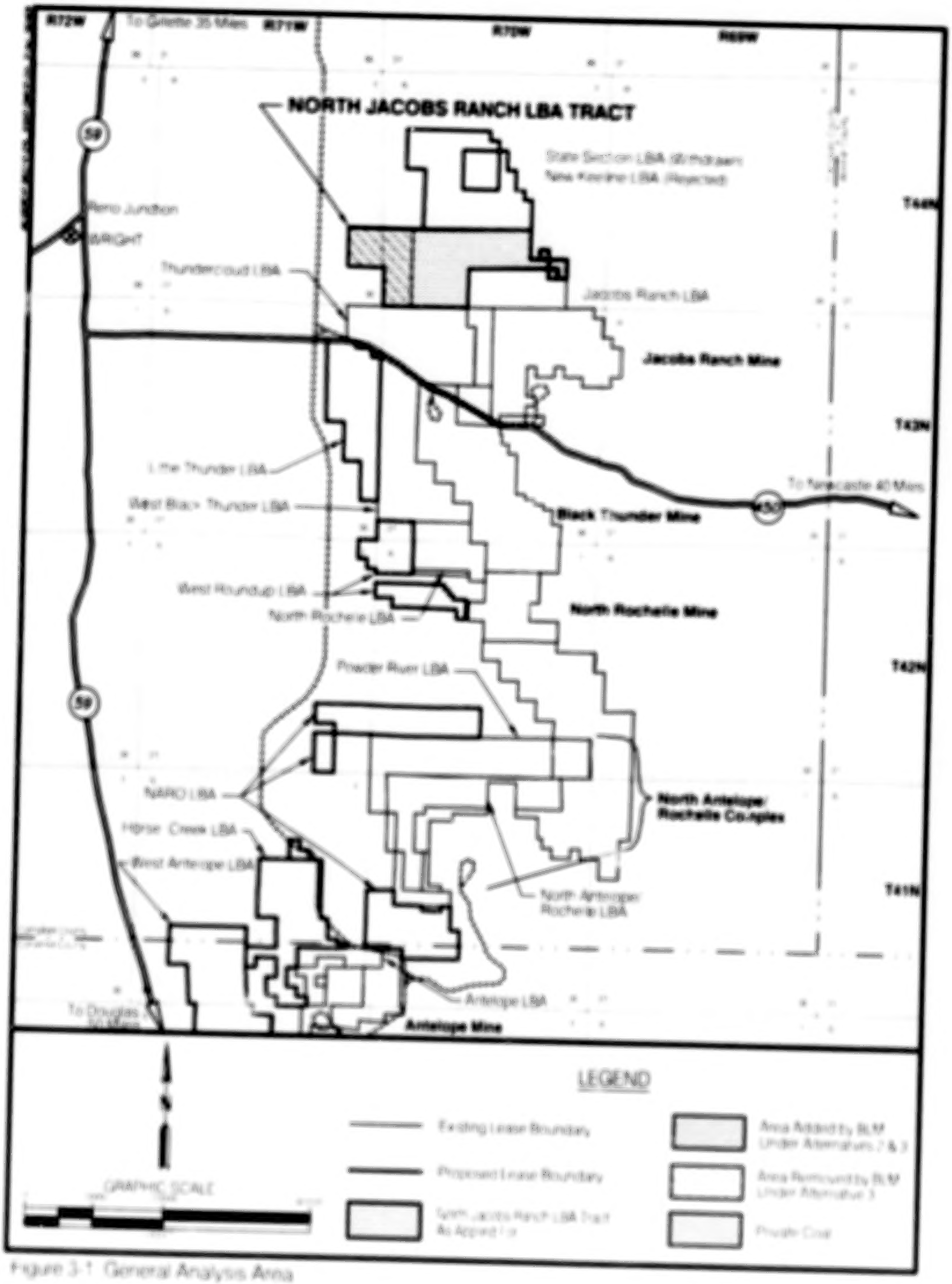

Figure 3-1 General Analysis Area

information describing the area's resources were gathered from draft BLM Buffalo Resource Area planning documents (BLM 1996a, 1996b, 1996c, 1996d, 1996g) and a BLM coal leasing study (BLM 1996e).

3.2 Topography and Physiography

The PRB is an elongated, asymmetrical structural downfold. It is bounded by the Casper Arch, Laramie Mountains, and Hartville Uplift to the south; the Miles City Arch in Montana to the north, the Big Horn Mountains on the west, and the Black Hills on the east. The Jacobs Ranch Mine is located on the gently dipping eastern limb of the structural basin, near the southern end. The regional dip in the area of the mine is approximately 1 degree to the northwest. There are local areas where the shallow strata dip at higher angles, generally due to local folding or faulting.

The PRB landscape consists of broad plains, low hills, and tablelands. Generally, the topography changes from open hills with 500-1,000 ft of relief in the northern part of the PRB to plains and tablelands with 300-500 ft of relief in the southern part. Playas are common in the basin, as are buttes and plateaus capped by clinker or sandstone. The LBA Tract is in an area consisting primarily of gently rolling terrain broken by minor drainages with an elevation ranging from 4,720 to 4,930 ft. Overall, the North Jacobs Ranch LBA Tract is similar in topography to that of the Jacobs Ranch Mine permit area. Slopes range from flat to 14 percent and average about 2 percent. A significant portion of both the Jacobs Ranch Mine permit area and the North Jacobs Ranch LBA Tract lie within closed basins. Slope analyses would be done for the LBA Tract if it is leased.

3.3 Geology

Stratigraphic units in the mine area that would be impacted if the North Jacobs Ranch LBA Tract is mined include, in descending order, recent (Quaternary age) alluvial and eolian deposits, the Eocene age Wasatch Formation (the overburden), and the Paleocene age Fort Union Formation (which contains the target coal beds). Figure 3-2 shows two geologic cross-sections drawn through the North Jacobs Ranch LBA Tract (one north-south and one east-west). These cross sections are representative of the geology in the vicinity of the LBA Tract, with the primary variables being the thickness of overburden, the parting thickness between the Lower and Middle Wyodak coal seams, and the surface topography. Figure 3-3 is a chart showing the stratigraphic relationships and hydrologic characteristics of the surface and subsurface geologic units in the area of the Jacobs Ranch Mine.

Surficial deposits in the analysis area include Quaternary alluvial and eolian deposits, Wasatch Formation, clinker, and weathered Wasatch and Fort Union Formations. There is very little clinker on the LBA Tract itself, although it is present in the analysis area. There are thin alluvial deposits along the ephemeral streams (Mills

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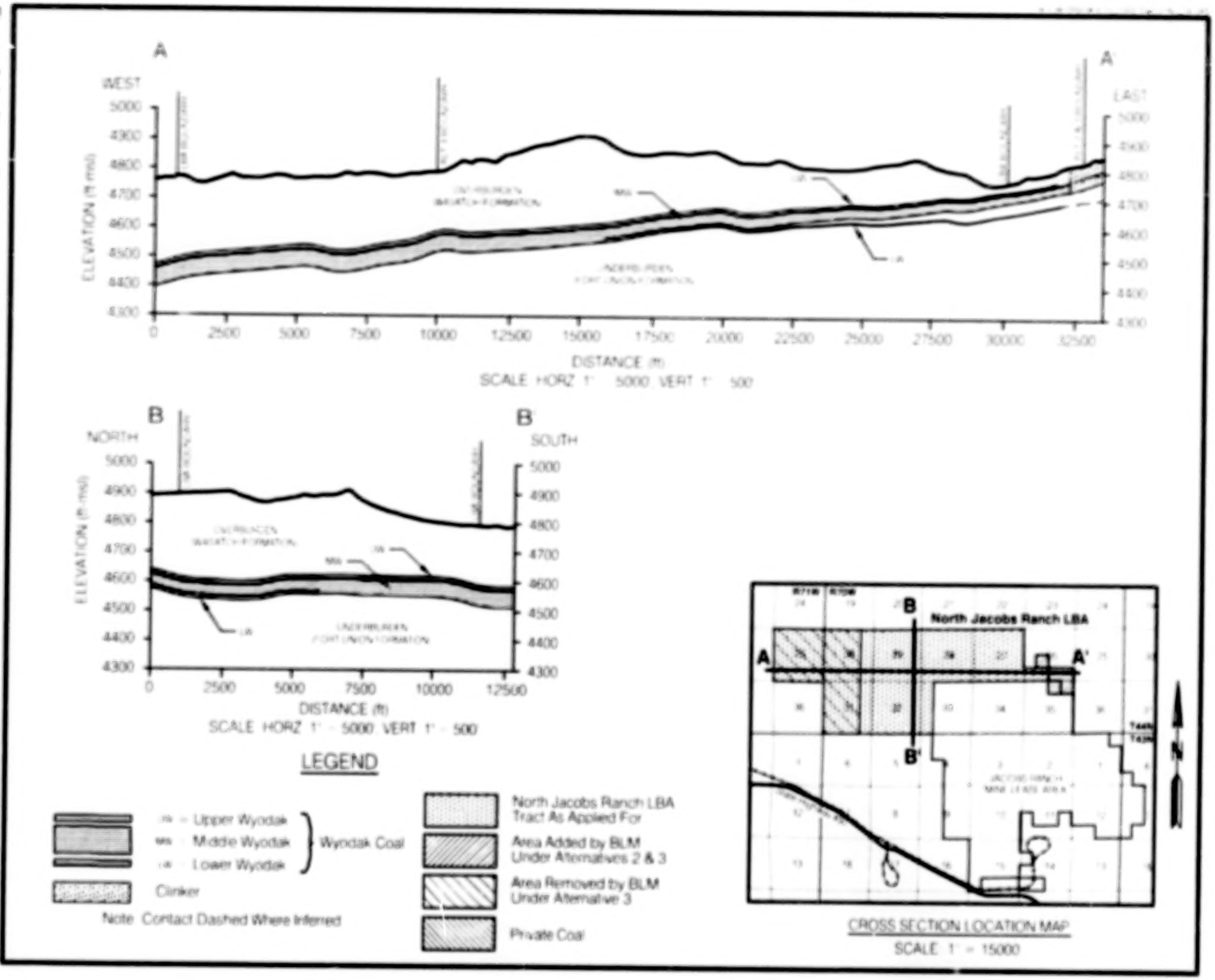
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UW
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15000
17500
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22500
25000
27500
30000
32500
DISTANCE (ft)
SCALE: HORZ 1" = 5000, VERT 1" = 500
B
B'
NORTH
SOUTH
LEGEND
UW = Upper Wyodak
MW = Middle Wyodak
LW = Lower Wyodak
Wyodak Coal
Clinker
Note: Contact Dashed Where Inferred
North Jacobs Ranch LBA Tract As Applied For
Area Added by BLM Under Alternatives 2 & 3
Area Removed by BLM Under Alternative 3
Private Coal
North Jacobs Ranch LBA
JACOBS RANCH MINE LEASE AREA
N
CROSS SECTION LOCATION MAP
SCALE: 1" = 15000

Figure 3-2. North-South and East-West Geologic Cross Sections, North Jacobs Ranch LBA Tract.

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Geologic Unit			Hydrologic Characteristics
RECENT ALLUVIUM HOLOCENE			Typically fine grained and poorly sorted in intermittent drainages. Occasional very thin, clean interbedded sand lenses. Low yields and excessive dissolved solids generally make these aquifers unsuitable for domestic, agricultural and livestock usage. Low infiltration capacity unless covered by sandy eolian blanket.
CLINKER HOLOCENE TO PLEISTOCENE			Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria, red dog, etc.) formed by melting and partial fusing from the burning coal. The baked rock varies greatly in the degree of alteration, some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated.
WASATCH FORMATION EOCENE			Lenticular fine sands interbedded in predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch formation generally does not meet Wyoming Class I drinking water standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality which does meet the Class I standard.
FORT UNION FORMATION PALEOCENE	TONGUE RIVER MEMBER	W A C	The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use.
	LEBO MEMBER		The Lebo Member, also referred to as "The Lebo Confining Layer" has a mean thickness of 711 feet in the PRB and a thickness of about 400 feet in the vicinity of Gillette (Lewis and Hotchkiss 1981). The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm (Lewis and Hotchkiss 1981).
	TULLOCK MEMBER		The Tullock Member has a mean thickness of 785 feet in the PRB and a mean sand content of 53 percent which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common but vary locally and may be as much as 40 gpm. Records from the SEO indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
UPPER CRETACEOUS	LANCE FORMATION		Sandstone and interbedded sandy shales and claystone provide yields generally of less than 20 gpm. Higher yields are sometimes achieved where sand thicknesses are greatest. Water quality is typically fair to good.
	FOX HILLS SANDSTONE		Sandstone and sandy shales yield up to 200 gpm, however, yields are frequently significantly less. The water quality of the Fox Hills is generally good with TDS concentrations commonly less than 1000 mg/l.
	PIERRE SHALE		This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions in solution.

W = WYODAK COAL; A = ANDERSON COAL; C = CANYON COAL

Figure 3-3. Stratigraphic Relationships and Hydrologic Characteristics of Latest Cretaceous and Early Tertiary and Recent Periods, Powder River Basin, Wyoming. (Compiled from Hodson et al. 1973 and Lewis and Hotchkiss 1981).

and Shipley Draws) and the closed basin drainage channels. They typically consist primarily of poor to well-sorted, irregularly bedded to laminated, unconsolidated sand, silt, and clay with minor intervals of fine gravel.

The Wasatch Formation forms most of the overburden on top of the recoverable coal seams in the Fort Union Formation in the general analysis area. It consists of interbedded lenticular sandstones, siltstones, shales, and thin discontinuous coals. There is no distinct boundary between the Wasatch Formation and the underlying Fort Union Formation. From a practical standpoint, however, the top of the mineable coal zone is considered as the contact between the two formations. The average overburden thickness on the LBA Tract is about 215 feet. Overburden thickness generally increases to the west due to the westerly dip of the beds in this area. Overburden thickness decreases in stream valleys where it has been removed by erosion.

The Fort Union Formation consists primarily of shales, mudstones, siltstones, lenticular sandstones, and coal. It is divided into three members: Tongue River (which contains the target coal seams), Lebo, and Tullock, in descending order (Figure 3-3).

The Tongue River member consists of interbedded claystone, silty shale, carbonaceous shale and coal, with lesser amounts of fine-grained sandstone and siltstone.

At the Jacobs Ranch Mine, there are three mineable coal seams. JRCC personnel refer to these seams as the Upper, Middle and Lower Wyodak. In parts of sections 10 and 15 of T43N, R70W these three beds coalesce to form one thick coal seam which, in the general analysis area, is referred to as the Wyodak. Several other names are applied to this coal seam, including the Wyodak-Anderson and Anderson-Canyon. The Wyodak-Anderson coal seam is mined at the Black Thunder Mine which is located immediately south of the Jacobs Ranch Mine (Figure 3-1).

On the North Jacobs Ranch LBA Tract, the Upper Wyodak averages 12.5 feet in thickness, the Middle Wyodak averages 51.5 feet in thickness, and the Lower Wyodak thickness averages 8.2 feet. The Upper Wyodak occurs throughout the LBA Tract, and it is separated from the Middle Wyodak by an average of 2.3 feet of parting. The Middle Wyodak merges with the Lower Wyodak at a line that trends roughly north-northwest through the centers of sections 28 and 33, T44N, R70W. To the east of this divergence line the Middle Wyodak and Lower Wyodak are separated by a parting that averages five feet thick but thickens to over 20 feet as it approaches the eastern edge of the tract (Figure 3-2). In the western half of the LBA Tract the Middle Wyodak and Lower Wyodak are merged with an average coal thickness of 56.7 feet.

The Lebo Shale and Tullock members of the Fort Union Formation underlie the Tongue River member (Figure 3-3). They consist primarily of sandstone, siltstone, mudstone, shale and coal. In general, the Tullock member contains more sand than the Lebo Shale member.

Mineral Resources

The PRB contains large reserves of fossil fuels including oil, natural gas or methane (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and scoria are mined in the PRB (BLM 1996g).

Coal. There are 14 active coal mines lying along a north/south line that parallels Highway 59 starting north of Gillette, Wyoming, and extending south for about 75 miles (Figure 1-1). The Rawhide Mine, located north of Gillette, is capable of producing but is not currently active. These mines are located where the Wyodak coal is at its shallowest depths, i.e., nearest the outcrop. A 15th mine, the Dave Johnston Mine, located about 35 miles southwest of the Jacobs Ranch Mine near Glenrock, Wyoming, is in the process of shutting down coal mining operations.

The Fort Union coal seams are subbituminous and are generally low-sulfur, low-ash coals. Typically, the coal being mined has a higher heating value south of Gillette than north of Gillette. According to the analyses of exploration drilling samples collected in the Jacobs Ranch Mine area, the recoverable coal reserve has an average heating value of approximately 8,600 Btu/lb and contains an average of 5.89 percent ash, 0.48 percent sulfur, 31.40 percent volatile matter, 33.87 percent fixed carbon, and 28.90 percent moisture.

Oil and Gas. Oil and gas have been produced in the PRB for more than 100 years from reservoir beds that range in age from Pennsylvanian to Oligocene (DeBruin 1996). There are approximately 500 fields that produce oil and/or natural gas from a number of formations of varying geologic ages in the PRB. The estimated mean amounts of undiscovered hydrocarbons in the basin are 1.94 billion barrels of recoverable oil and 1.60 trillion ft^3 of gas (USGS 1995). Depth to gas and oil-bearing strata is generally between 4,000 ft and 13,500 ft, but some wells are as shallow as 250 ft.

The LBA Tract overlies geologic structures that contain producible quantities of oil and gas. The Hilight Oil and Gas Field, which was discovered in 1969, underlies the LBA Tract. The main zone of production at the Hilight Field is the Early Cretaceous Muddy Sandstone, which lies approximately 9,000 feet below the surface in this area. See Section 3.11 for further discussion of wells that are currently producing and associated facilities.

Coal Bed Methane. The generation of methane gas from coal beds occurs as a natural process. Methane produced by coal may be trapped in the coal by overburden pressure, by the pressure of water in the coal, or by impermeable layers immediately above the coal. The methane may also migrate upward and be trapped in shallower rocks (like sandstone), or it may disperse to the atmosphere. Deeper coal beds have higher pressures and generally trap more gas. Under favorable geologic conditions, methane can be trapped at shallow depths in and above coal beds, and this seems to be the case in the PRB. Without the existence of conditions which act to trap the gas in shallow coals or in adjacent sandstones, the gas escapes to the atmosphere. It is likely that much of the methane generated by the coal beds in the PRB has gradually escaped into the atmosphere because of the relatively shallow coal burial depths in the basin. However, a large amount also remains in the coal, probably due primarily to the presence of effective seals in the sediments overlying the coal.

Historically, methane has been reported flowing from shallow water wells and coal exploration holes in parts of the PRB. According to DeBruin and Jones (1989), most of the documented historical occurrences have been in the northern PRB. Olive (1957) references a water well in T.54N., R.74W. which began producing gas for domestic use in 1916.

CBM has been commercially produced in the Powder River Basin since 1989 when production began at Rawhide Butte Field, west of the Eagle Butte Mine. CBM exploration and development is currently ongoing throughout the PRB in Wyoming, and it is estimated that there are now more than 5,000 productive wells in place.

Since the early 1990's, the BLM has completed numerous EAs and two EISs analyzing CBM projects. The last of these was the Wyodak CBM Project EIS, which was completed in 1999. The Wyodak EIS project area included 3,600 square miles of mixed federal, state, and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM is currently preparing an EA to analyze the impacts of drilling as many as 2,500 additional federal drainage protection wells within the Wyodak EIS project area. These wells would be drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases that are adjacent to and potentially being drained by wells drilled on private or state oil and gas leases. BLM is also preparing a new regional EIS to analyze the cumulative impacts of reasonably foreseeable CBM and conventional oil and gas development within the Wyoming portion of the PRB.

CBM resources are currently being evaluated on the North Jacobs Ranch LBA tract. The well spacing for CBM wells that is currently approved by the Wyoming Oil and Gas Conservation Commission is one well per 80 acres or eight wells per section. A maximum of 60 CBM wells could be drilled on the North Jacobs Ranch LBA tract under this spacing pattern under any of the alternatives being analyzed in this EIS. As of September 1, 2000, fifty potential drill sites had been identified on the tract by the existing oil and gas lessees, and seventeen wells were being or had been drilled on the tract. The oil and gas lessee has reported potentially economic shows of CBM from wells drilled on or near the North Jacobs Ranch LBA tract, but commercial CBM production from these wells has been waiting on completion of local and regional pipelines to transport the CBM. The ownership of oil and gas resources in the LBA tract is discussed in Section 3.11 of this EIS.

Bentonite. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, and because of this characteristic it is used in a number of processes and products, including cat litter and drilling mud. No mineable bentonite reserves have been identified on the North Jacobs Ranch LBA Tract.

Uranium. There are substantial uranium reserves in southwestern Campbell and northwestern Converse Counties. Uranium exploration and mining were very active in the 1950's, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply reduced uranium mining activities in the early 1980's. There are currently three in-situ leach operations in the PRB, although production at one of the three will end in 2000. No known uranium reserves exist on the North Jacobs Ranch LBA Tract.

Scoria. Scoria or clinker has been and continues to be a major source of gravel for road construction in the area. Scoria is present within the Jacobs Ranch Mine area, although scoria is not present on the LBA Tract as applied for under the Proposed Action. Scoria is present within the Alternatives 2 and 3 Tracts.

3.4 Soils

The soils on the North Jacobs Ranch LBA Tract are typical of the soils that occur on the adjoining Jacobs Ranch Mine. Most of the LBA Tract was subjected to an order 1-2 soils survey in 1999. The area covered in the study includes the LBA Tract under the Proposed Action and Alternative 2, as well as the area that would be disturbed if the tract were mined.

Based on the baseline soils studies, there is enough suitable topsoil for salvaging within the LBA Tract under the Proposed Action and Alternatives 2 and 3 to redistribute suitable soils to an average depth of about two to three feet over all disturbed areas.

All soil surveys were completed to an order 1-2 resolution in accordance with WDEQ/LQD Guideline No. 1 which outlines required soils information necessary for a coal mining operation. The inventories included field sampling and observations at the requisite number of individual sites, and laboratory analysis of representative collected samples.

The following is a list of the soil series that comprise the various map units delineated on the proposed affected area associated with the North Jacobs Ranch LBA Tract under the Proposed Action, including the area added under Alternative 2 and Lot 2 of Section 35, T.44N., R.70W.

Soils developing predominantly in alluvial or colluvial fan deposits

- Arvada, thick surface – Arvada – Slickspots complex, 0 to 6 percent slopes
- Bidman loam, 0 to 6 percent slopes
- Bidman – Ulm loams, 0 to 6 percent slopes
- Bidman – Parmleed, 0 to 6 percent slopes
- Cambria – Kishona – Zigweid loams, 0 to 6 percent slopes
- Decolney – Hiland sandy loams, 0 to 6 percent slopes
- Forkwood – Cushman loams, 0 to 6 percent slopes
- Maysdorf fine sandy loam, 0 to 6 percent slopes
- Teckla very fine sandy loam, 0 to 10 percent slopes
- Ulm loam, 0 to 6 percent slopes
- Ulm clay loam, 0 to 6 percent slopes
- Ulm – Renohill complex, 0 to 6 percent slopes

Soils developing predominantly in residuum on uplands

- Felix clay, ponded, 0 to 2 percent slopes
- Hiland fine sandy loam, 0 to 6 percent slopes
- Hiland – Bowbac sandy loams, 0 to 6 percent slopes
- Hiland – Bowbac sandy loams, 6 to 15 percent slopes
- Keeline – Tullock – Niobrara complex, 3 to 30 percent slopes
- Theedle – Kishona loams, 0 to 6 percent slopes
- Theedle – Kishona loams, 6 to 20 percent slopes
- Theedle – Shingle loams, 3 to 30 percent slopes
- Wibaux – Shingle – Rock Outcrop complex, 6 to 60 percent slopes

Soils developing predominantly in eolian sand deposits

- Pugsley – Decolney sandy loams, 0 to 6 percent slopes
- Terro – Taluce sandy loam, 6 to 30 percent slopes
- Turnercrest – Keeline – Taluce sandy loams, 6 to 30 percent slopes
- Vonalee sandy loam, 0 to 10 percent slopes
- Vonalee – Terro sandy loams, 2 to 10 percent slopes

Table 3-1 provides the extent of six depth classes of suitable topsoil within the LBA Tract under the Proposed Action, including the area added under Alternative 2 and Lot 2 of Section 35, T.44N., R.70W.

An average of about two feet of topsoil will be redistributed on all disturbed acres. Areas of unsuitable soils

Table 3-1. Acres of Topsoil Available for Reclamation Within the North Jacobs Ranch LBA Tract Under the Proposed Action, Including the Area Added Under Alternative 2 and Lot 2 of Section 35, T.44N., R.70W.

Thickness of Suitable Topsoil (inches)	Acres	Percent
0	384.2	7.6
0 - 12	0.0	0.0
12 - 30	1431.5	28.5
30 - 48	1765.6	35.2
48 - 60	1441.4	28.7
> 60	0.0	0.0
Total	5022.7	100.0

include sites with high alkalinity, salinity or clay content.

The soil depths and types on the North Jacobs Ranch LBA Tract under the Proposed Action and Alternative 2 are similar to soils currently being salvaged and utilized for reclamation at the adjacent mine and other mines in the PRB. The tract is expected to have an adequate quantity and quality of soil for reclamation. The site-specific soil surveys have located hydric soils and/or inclusions of hydric soils. Wetland surveys are discussed in Section 3.8.

3.5 Air Quality

Wind speeds for the region average from nine to 13 miles per hour with local variations due to differences in topography. Winds are predominantly from the northwest and the southeast and tend to be strongest in the winter and spring and calmer in the summer. Wind velocity tends to increase during the day and decrease during the night. A wind rose diagram along with the air quality and meteorological sampling locations for the Jacobs Ranch Mine are depicted on Figure 3-4.

The air quality of the PRB area is generally good. WDEQ/AQD assumes a background PM_{10} concentration of $15 \mu g/m^3$ for regulatory purposes (Judy Shanley, April 2000). Figure 3-5 is a depiction of visibility impairment measured in deciviews (dv). A dv is a general measure of view impairment caused by pollution. A dv of 13 translates to a view of approximately 60 miles, which, in the PRB is common viewing distance. As can be seen from Figure 3-5, the only areas of the U.S. with less view impairment than the PRB are the Colorado Plateau (dv = 11) and the Great Divide Basin (dv = 10).

The basic regulatory framework governing air quality in Wyoming is the Wyoming Environmental Quality Act, the accompanying Air Quality

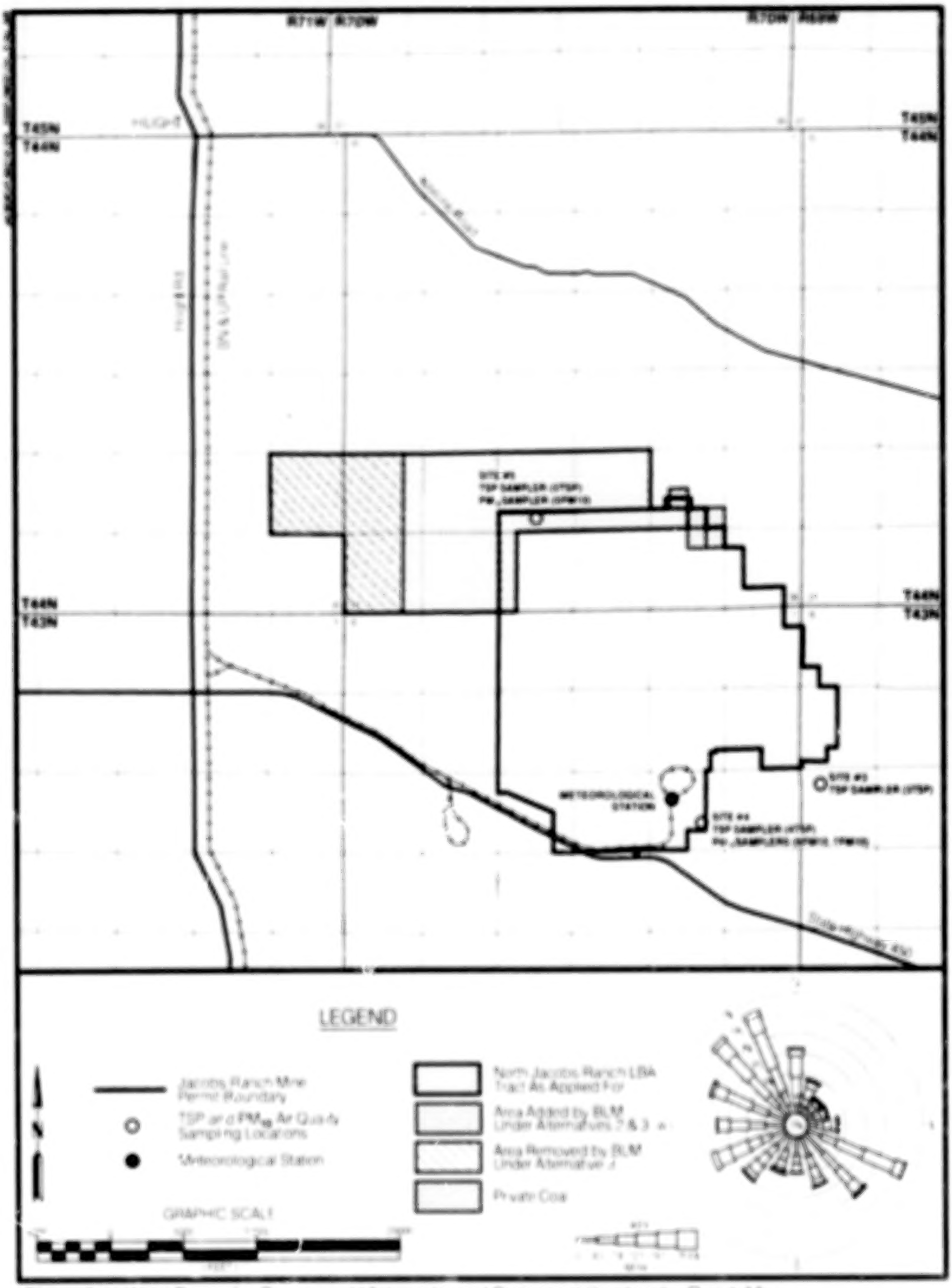

Figure 3-4 Wind Rose, Air Quality and Meteorological Stations at the Jacobs Ranch Mine

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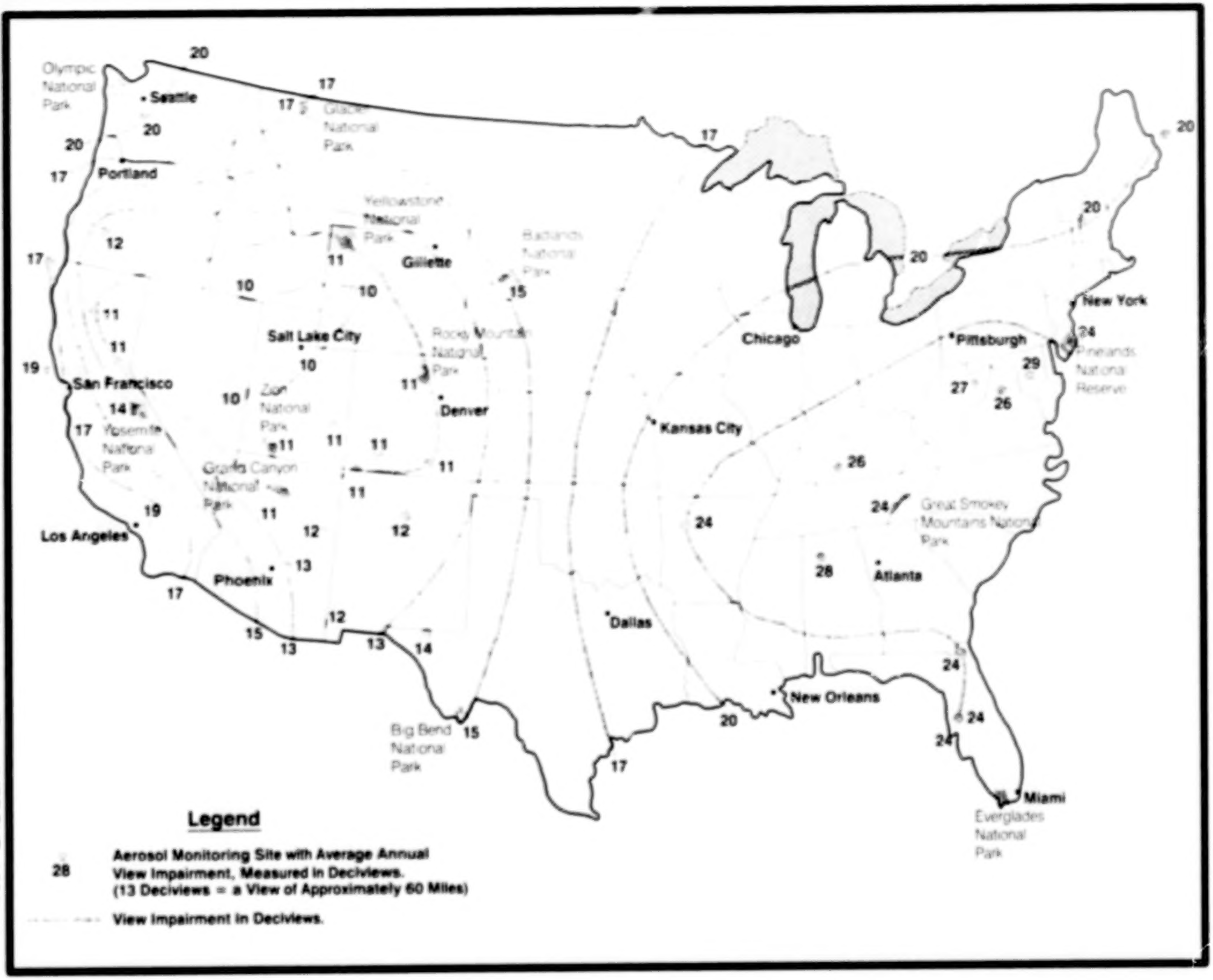

Figure 3-5. Average Annual View Impairment as a Function of Light Extinction. (From IMPROVE, 1995)

Standards and Regulations promulgated by the Wyoming Environmental Quality Council, and the State Implementation Plan approved by the EPA under the Clean Air Act. This regulatory framework includes state air quality standards, which must be at least as stringent as National Ambient Air Quality Standards, and allowable increments for the prevention of significant deterioration of air quality. Wyoming's ambient air standards are shown in Table 3-2.

The Prevention of Significant Deterioration (PSD) program is designed to protect air quality from significant deterioration in areas already meeting state standards. In other words, an increase in ambient air pollutant concentrations, above the area baseline, is allowable if the state standard increment for the pollutant is not exceeded for the area. The increment allowable under PSD depends on the area's designation as Class I, II, or III. Class I areas are allowed the smallest increment and Class III the largest. The area the coal mines are located in is Class II, as is all of Wyoming outside the national parks and wilderness areas.

The Class I area that is closest to the North Jacobs Ranch LBA Tract is Wind Cave National Park in southwestern South Dakota. This national park is approximately 80 miles east of the LBA Tract. The next closest Class I area is Badlands National Park, which is approximately 120 miles east of the LBA Tract.

Wyoming's PSD standards for particles are identical to federal standards, except that Wyoming has not adopted Class III standards (Table 3-3). Coal mining around the North Jacobs Ranch LBA Tract is not

Table 3-2. Regulated Air Emissions for Wyoming.

Emissions	**Averaging Period**	**Wyoming Standard ($\mu g/m^3$)**	**National Standard ($\mu g/m^3$)**
PM_{10}	24-hour[1]	150	150
	annual[2]	50	50
Nitrogen Oxide (NO_x)	annual[2]	100	100
Photochemical Oxidant (O_3)	1-hour[1]	160	235
Sulfur Dioxide (SO_2)	3-hour[1]	1,300	---
	24-hour[1]	260	365
	annual[2]	60	80
Carbon Monoxide (CO)	1-hour[1]	40,000	40,000
	8-hour[1]	10,000	10,000

[1] Standards not to be exceeded more than once per year.
[2] Annual arithmetic mean not to be exceeded.

Table 3-3. Maximum Allowable Increases for Prevention of Significant Deterioration of Air Quality: Particles.

Emission	Averaging Time	Maximum Allowable Increments of Deterioration ($\mu g/m^3$) Class I	Class II	Class III[2]
PM_{10}	Annual Mean	4	17	--
	24-hour[1]	8	30	--

[1] Maximum allowable increment may be exceeded once per year at any receptor site.

[2] Wyoming has not adopted Class III standards.

currently affected by the PSD regulations because surface coal mines are not one of the 28 EPA-listed major emitting facilities for PSD regulation, and point-source emissions from these mines do not exceed the PSD emissions threshold for applicability of 250 tons per year.

In the vicinity of the North Jacobs Ranch LBA Tract, the main sources of air pollution are surface coal mines, vehicle traffic, and various sources associated with oil and gas production, railroad traffic and farming and ranching activities. The closest existing power plant is approximately 35 miles southwest of the LBA Tract (Dave Johnston); however, two new power plants have been proposed closer to the tract (ENCOAL-about eight miles south of the tract, and Two Elk-about six miles southeast of the tract). These plants are not currently under construction, and no construction activities are scheduled at this time for either plant.

The major type of emission from surface coal mining activities is fugitive dust. Blasting and moving overburden, crushing, loading, and hauling coal, and the large areas of disturbed land all produce dust. Wyoming's ambient air standards for PM_{10} are shown in Table 3-2. PM_{10} is respirable particulate matter (less than 10 microns) which can penetrate into the lungs and cause health problems. Wyoming recently dropped their standards for TSP (total suspended particles) in favor of PM_{10} to match federal standards.

Blasting is also responsible for another type of emission from surface coal mining. Overburden blasting sometimes produces low-lying gaseous orange clouds which contain nitrogen oxides (NO_x). Increasing public concern over this issue prompted a WMA-sponsored symposium, which was held in Gillette on January 12 and 13, 2000. The symposium brought together experts from the industry and regulatory agencies to discuss possible causes and solutions to excessive NO_x emissions from blasting.

Vehicle traffic, both inside and outside the areas of surface coal mining, is responsible for tailpipe emissions and for the emission of fugitive dust from paved and unpaved surfaces. Vehicle emissions consist primarily of NO_x and carbon monoxide (CO), but also may include sulfur dioxide (SO_2) and, by secondary processes, ozone (O_3). The national and state standards for emissions of these substances are also shown in Table 3-2.

The compressor stations and large generators associated with oil and gas production and transport and with fossil fuel-fired power plants produce emissions of NO_x, SO_2, CO, TSP, PM_{10}, volatile organic compounds, and smaller amounts of other pollutants.

The main pollutant of concern associated with the locomotives used to haul the coal and other commodities is NO_x. The main pollutants produced by farming and ranching activities are dust and NO_x.

In order to obtain a state air quality construction and operating permit, each mine may be required to demonstrate, through dispersion modeling, that its activities will not increase PM_{10} levels above the annual standard established by the Wyoming Air Quality Standards and Regulations (WDEQ/AQD 1995). The modeling demonstration must include the estimated air pollutant emissions from other existing pollution-generating activities, including adjacent mines, so that control of overall air quality is part of the permitting process.

WDEQ/AQD has presented testimony in public hearings documenting that the air quality resource in the region including the North Jacobs Ranch LBA Tract did not diminish from 1980 through 1988, although coal production in the region increased substantially during that period. Air quality particle data from that report is summarized in Table 3-4. To summarize the monitoring data in comparative form, averages of the geometric means from all sites were calculated for each calendar year. Over 23,000 samples are represented in Table 3-4. The information presented by the WDEQ/AQD shows that air quality in the Wyoming portion of the PRB did not deteriorate while coal production increased nearly 2.5 times in the 1980-1988 period. This is due in part to the conditions attached to air quality permits. These conditions stipulate control measures that must be implemented by the mine operators to meet air quality standards. These measures include increased sprinkling, use of approved chemicals to control dust, limiting the amount of disturbed area, temporary vegetation of disturbed areas, and contemporaneous reclamation. In the mining areas immediately adjacent to the North Jacobs Ranch LBA Tract, historical particle ambient air quality data show the same result for the Jacobs Ranch Mine as described above for the PRB as a whole. Figure 3-6 presents a plot of average annual TSP measured at Site #5 (predominantly upwind) and Site #3 (predominantly downwind) at the Jacobs Ranch Mine for the years 1995 through 1999. The difference in

Table 3-4. Summary of WDEQ/AQD Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988.

Year	Number of Mines Producing/ Monitoring[1]	# Sites[2]	Coal Produced (MMTPY)	Overburden (MMBCY)	TSP Average of All Geometric Means (μg/m³)
1980	10/12	29	58.8	93.2	30.8
1981	11/13	34	68.9	108.0	30.4
1982	11/15	43	81.4	120.7	23.1
1983	13/15	41	88.0	157.2	24.3
1984	14/15	44	106.8	166.6	24.3
1985	16/15	45	113.8	196.3	24.3
1986	16/16	46	114.6	169.6	20.5
1987	16/16	45	124.6	180.9	25.6
1988	16/16	45	139.1	209.8	29.3

Notes: [1] Mines include Buckskin, Rawhide, Eagle Butte, Fort Union, Clovis Point, Wyodak, Caballo, Belle Ayr, Caballo Rojo, Cordero, Coal Creek, Jacobs Ranch, Black Thunder, North Antelope/Rochelle, Antelope, and North Rochelle.

[2] Some sites include more than one sampler, so the number of samplers is greater than the number of sites.

Source: From WDEQ/AQD 1989 (This study has not been updated).

TSP at these two sites is also plotted on Figure 3-6, as are the coal and overburden production amounts for these years. Some general inferences can be made from Figure 3-6. The annual arithmetic mean TSP at both the upwind and downwind sites remained fairly constant (around 30 μg/m³) from 1995 through 1998, while coal and overburden production also remained relatively constant. The mine's overburden production increased from 57.8 million cubic yards in 1998 to 82.3 million cubic yards in 1999. The TSP at both the upwind and downwind monitoring sites also increased; however, the difference in TSP between Sites #3 and #5 did not show a like increase in 1999. In fact, the annual arithmetic mean TSP concentration was greater at the upwind site than the downwind site. Figure 3-6 shows that as the rate of overburden production increased there was not a proportionate increase in TSP measured at the downwind mine boundary relative to the upwind mine boundary.

Before adoption of the current annual PM_{10} standard, the annual particulate standard was 60 μg/m³ of TSP (geometric mean). As Figure 3-6 shows, the average annual TSP at Site #4 in 1999 (which was 55.6

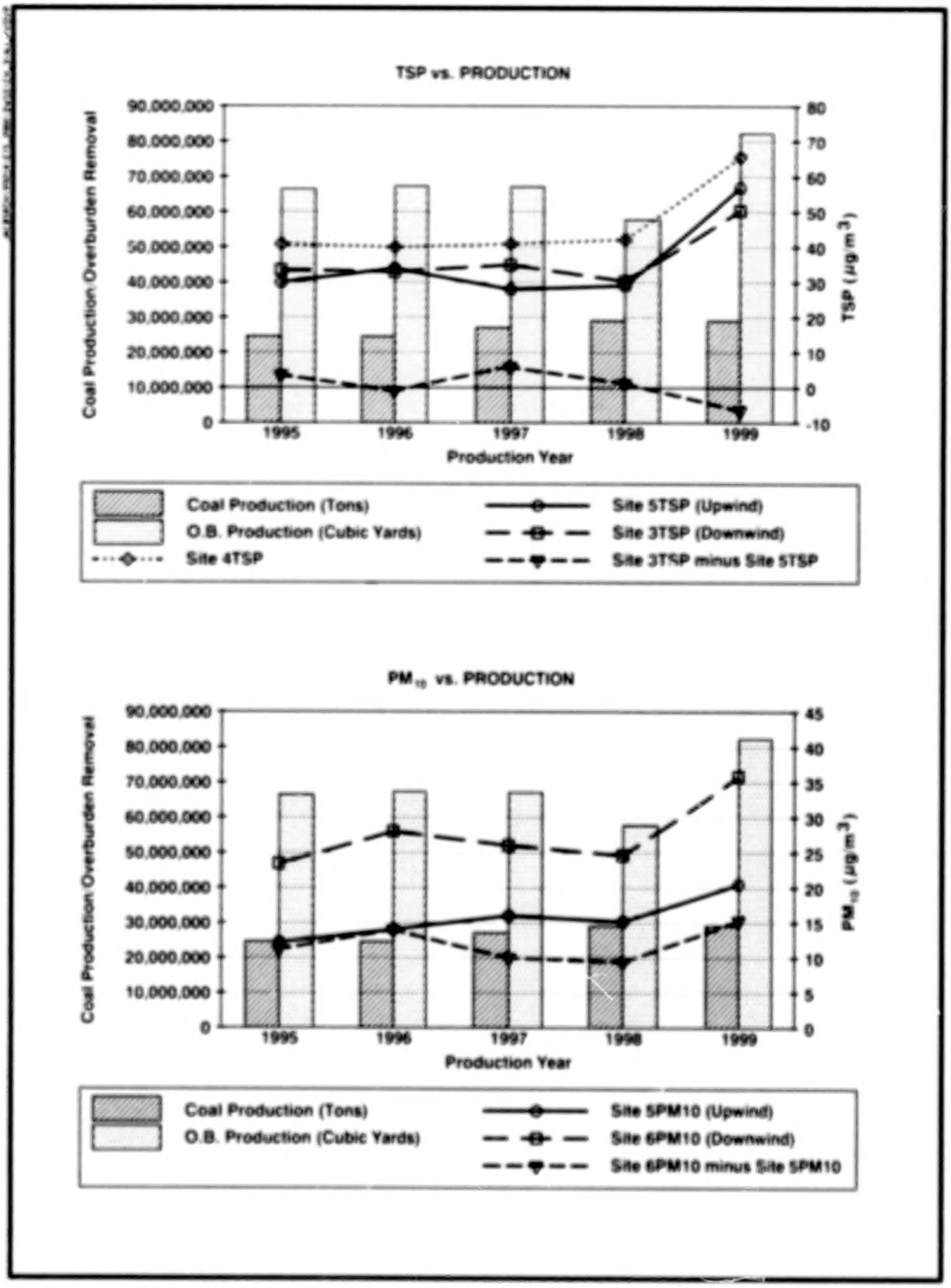

Figure 3-6 Coal Production and Overburden Removal vs. Ambient Particulates for Jacobs Ranch Mine

μg/m^3) exceeded this former standard. Of the three air quality monitoring stations at the Jacobs Ranch Mine, Site #4 is located closest to the railroad loop, truck dump, coal plant and service facilities (Figure 3-4). The average annual TSP at Sites #3 and #5 were below the former standard from 1995 through 1999.

The current annual PM_{10} standard of 50 μg/m^3 was not exceeded at the three air quality monitoring stations from 1995 through 1999. Within this five-year time period the PM_{10} arithmetic means for the Jacobs Ranch Mine at the downwind Site #4 (6PM10 and 7PM10), in micrograms per cubic meter, are as follows: 1995 = 24.5; 1996 = 28.0; 1997 = 26.0; 1998 = 25.2, and 1999 = 35.6. The Jacobs Ranch Mine received no air quality violations during the 1995 through 1999 time period.

Nitrogen dioxide (NO_2) was monitored from 1975 through 1983 and from March 1996 through May 1997 in Gillette, Wyoming. NO_2 data has also been collected at some of the mines in recent years. Table 3-5 summarizes the results of that monitoring. The North Jacobs Ranch LBA Tract is located approximately 40 miles south of Gillette and immediately north of the Black Thunder Mine (Figure 1-1).

3.6 Water Resources

3.6.1 Groundwater

Within the North Jacobs Ranch LBA Tract there are two water-bearing geologic units that could be disturbed

Table 3-5 Annual Ambient NO_2 Concentration Data.

Year	Gillette		Black Thunder Mine		Belle Ayr Mine	
	NO_2 (μg/m^3)[1]	% of Standard	NO_2 (μg/m^3)[1]	% of Standard	NO_2 (μg/m^3)[1]	% of Standard
1975	6	6%				
1976	4	4%				
1977	4	4%				
1978	11	11%				
1979	11	11%				
1980	12	12%				
1981	14	14%				
1982	11	11%				
1983[2]	17	17%				
1996[3]	13	13%	13	13%	16	16%
1997[4]	28	28%	23	23%	33	33%

[1] Arithmetic Average

[2] Monitoring discontinued December 1983, reactivated March 1996 to April 1997.

[3] 1996 arithmetic average-March to December

[4] 1997 arithmetic average-January to April

Source: Wyoming Ambient Air Monitoring Data, 1997. Wyoming Department of Environmental Quality.

by mining. In descending order, these units are the Wasatch Formation overburden and the Wyodak coal seam. The sub-coal Fort Union Formation is utilized for water supply at the Jacobs Ranch Mine but will not be disturbed by mining activities. The stratigraphic units beneath the North Jacobs Ranch LBA Tract and the hydrologic properties are displayed in Figure 3-3.

JRCC completed 13 monitoring wells within and near the North Jacobs Ranch LBA Tract in 1999; seven in the Wasatch Formation overburden and six in the Wyodak Coal. The locations of these new monitoring wells are shown on Figure 3-7. Data from these wells, as well as previously collected data at the Jacobs Ranch Mine, were used to prepare the following description of baseline groundwater conditions within the LBA Tract.

Recent Alluvium

Within the North Jacobs Ranch LBA Tract, the surface drainages are generally dry draws and the alluvium, colluvium and playa deposits associated with these draws are generally thin and not laterally extensive enough to be considered an aquifer. In addition, these unconsolidated deposits are typically very fine-grained and have very limited permeabilities, precluding any significant storage and movement of groundwater.

Wasatch Formation

Within the PRB the Wasatch Formation consists of interbedded sandstones, siltstones and shale with occasional discontinuous coal stringers and clinker deposits, and this description basically holds true for the LBA Tract. Saturated strata within the Wasatch are limited in areal extent and are typically thin, lenticular sandstones. The hydraulic connection between sandstone lenses is tenuous due to intervening shale aquitards; thus, groundwater movement through the Wasatch Formation overburden is limited. The sandstone and thin coal stringers, where saturated, will yield water to wells, and this water is primarily used for stock watering. Because the saturated sandstone and coal units within the Wasatch Formation are not continuous, the Wasatch is not considered to be a regional aquifer.

Another geologic unit which may be considered a part of the Wasatch Formation is scoria, also called clinker or burn. It consists of Wasatch sediments which overlaid the coal at one time in the past before the coal burned naturally. These sediments were baked, fused and melted in place, then collapsed into the void left by the burned coal. Scoria deposits can be a very permeable aquifer and can extend laterally for miles in the eastern PRB. Scoria deposits do not occur within the LBA Tract under the Proposed Action although they are present immediately east and therefore occur within the Alternative 2 and Alternative 3 Tracts. The hydrologic

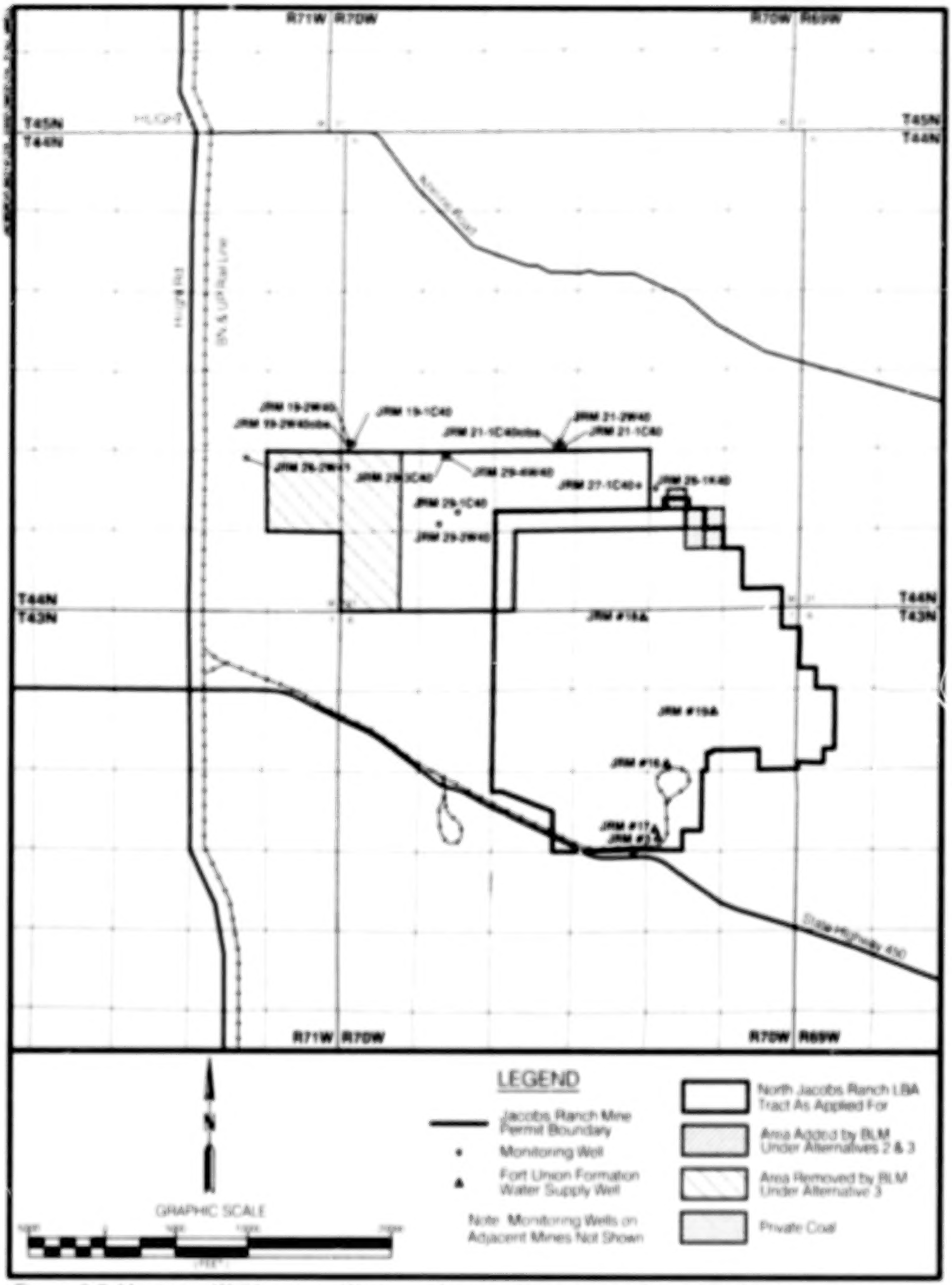

Figure 3-7 Monitoring Well Locations Within and Near the North Jacobs Ranch LBA Tract and Fort Union Formation Water Supply Well Locations at the Jacobs Ranch Mine

function of scoria in the general area is to provide infiltration of precipitation and recharge to laterally contiguous overburden and Wyodak coal.

Recharge to the Wasatch Formation is from the infiltration of precipitation and lateral movement of water from adjacent clinker bodies. Regionally, groundwater is discharged from the Wasatch Formation by evaporation and transpiration, by pumping wells, and by seepage into the alluvium along stream drainages. For the Wasatch Formation as a whole, the discontinuous nature of the water bearing units results in low overall hydraulic conductivity and low groundwater flow rates. Because of the varied nature of the aquifer units within the Wasatch, hydraulic properties are variable as well. Martin, et al. (1988) reported that hydraulic conductivities within the Wasatch ranged from 10^{-4} ft/day to 10^{2} ft/day and the geometric mean hydraulic conductivity based on 203 tests was 0.2 ft/day. The geometric mean hydraulic conductivity from 70 aquifer tests using wells completed in sandstone in the Wasatch overburden was 0.35 ft/day, while that from 63 aquifer tests completed in siltstone and claystone in the Wasatch overburden was 0.007 ft/day (Rehm et al. 1980). The Wasatch Formation within the North Jacobs Ranch LBA Tract is similar to this latter figure in that there is relatively little saturated sand present within the low-permeability silts and clays that make up most of the overburden.

Water quality in the Wasatch Formation is extremely variable, with TDS concentrations ranging from approximately 1,000 mg/L to 5,500 mg/L in the vicinity of the LBA Tract. Groundwater from the Wasatch Formation is predominantly a sodium sulfate type within the Jacobs Ranch Mine area and the North Jacobs Ranch LBA Tract.

Wyodak Coal

Due to its continuity, the Wyodak coal seam is considered a regional aquifer within the PRB. Within the North Jacobs Ranch LBA Tract, the Wyodak coal contains partings which in places separate the Wyodak into two or three mineable seams (the Upper, Middle, and Lower Wyodak). The total coal sequence ranges from 50 feet to 70 feet thick and dips to the west at less than 1 percent. Despite the occurrence of three separate seams the Wyodak coal is considered to be a single aquifer in the general analysis area. The partings are discontinuous and typically only the lower half of the coal sequence is saturated.

Hydraulic conductivity within the Wyodak coal seam is highly variable and is reflective of the amount of fracturing the coal has undergone, as unfractured coal is virtually impermeable. The yield of groundwater to wells and mine pits is smallest where the permeability of the coal is derived primarily from localized unloading fractures. These fractures, which are the most common, were created by the expansion of the coal as the weight of overlying sediments was slowly removed by erosion. The highest permeability is imparted to the coal by tectonic fractures. These are through-going fractures of areal importance created during deformation of the south Powder River structural basin. The presence of these fractures can be recognized by their linear expression at the ground surface, controlling the orientation of stream drainages and topographic depressions. Due to their pronounced surface expression, these tectonic fractures are often referred to as "lineaments". Coal permeability along lineaments can be increased by orders of magnitude over that in the coal fractured by unloading only.

New monitoring wells have been installed in the Wyodak coal aquifer within and adjacent to the North Jacobs Ranch LBA Tract, although aquifer tests have not yet been conducted. Hydraulic properties of the coal can be expected to be similar to that of the coal within the adjacent Jacobs Ranch Mine permit area. Coal aquifer hydraulic conductivity measured at the Jacobs Ranch Mine ranges from 0.07 to 1.60 ft/day. The U.S. Geological Survey reports an average coal aquifer hydraulic conductivity of 0.8 ft/day for the general area (Martin et al. 1988).

Only the lower half of the coal sequence is saturated within the Jacobs Ranch Mine permit area. The Wyodak coal in the vicinity of the North Jacobs Ranch LBA Tract is therefore under predominantly unconfined (water table) conditions. The average storage coefficient reported for the Jacobs Ranch Mine is 0.01.

The chemistry of groundwater in the coal is variable within the adjacent Jacobs Ranch Mine permit area and the North Jacobs Ranch LBA Tract. In general, it is a calcium sulfate type with relatively high TDS concentrations (2,000 to 3,000 mg/L) in the eastern part of the tract and Jacobs Ranch Mine. The coal groundwater chemistry transitions to a sodium bicarbonate type with much lower TDS concentrations (500 to 1,000 mg/L) as it moves into the western part of the tract and Jacobs Ranch Mine area.

Prior to mining, the direction of groundwater flow within the coal aquifer was generally from recharge areas near the outcrop and burn zone into the basin, following the dip of the coal. Site-specific water-level data collected by JRCC in the vicinity of the LBA Tract and presented in the GAGMO 15-year report (Hydro Engineering 1996a) indicate that the groundwater flow directions have been influenced by mining activities. Groundwater flow within the coal aquifer in the vicinity of the LBA Tract is now toward nearby mine pits.

Subcoal Fort Union Formation

The subcoal Fort Union Formation can be divided into three hydrologic units: the Tongue River aquifer, the Lebo Member, and the Tullock aquifer (Law 1976). The hydrologic units below the Wyodak coal are not directly disturbed by mining, but many mines use them for water supply wells. The Tongue River aquifer consists of lenticular fine-grained shale and sandstone. The Lebo Member, also referred to as "the Lebo Confining Layer," is typically more fine-grained than the other two members and generally retards the movement of water (Lewis and Hotchkiss 1981). The Tullock aquifer consists of discontinuous lenses of sandstone separated by interbedded shale and siltstone. Transmissivity is the product of an aquifer's hydraulic conductivity or permeability times it thickness and is commonly used when discussing the hydraulic properties of the Fort Union Formation, where wells are completed by exposing many discrete sand lenses to the well bore. Transmissivities are generally higher in the deeper Tullock aquifer than in the Tongue River or Lebo, and many mines in the PRB have water-supply wells completed in this interval (Martin et al. 1988). The average transmissivity for this member as reported by OSM (1984) is 290 ft^2/day.

Near the North Jacobs Ranch LBA Tract, JRCC reports that it is difficult to distinguish the Lebo Confining Layer from sand-poor sequences of the overlying Tongue River aquifer and the underlying Tullock aquifer (JRCC 1999a). Therefore, JRCC refers only to the Upper and Lower Fort Union Formation. The Upper unit consists of the Tongue River-Lebo aquifer and the Lower unit consists of the Tullock aquifer. Transmissivities of the Upper Fort Union Formation at the Jacobs Ranch Mine range from about 30 to 50 ft^2/day. Transmissivities of the Lower Fort Union Formation at the Jacobs Ranch Mine range from about 180 to 380 ft^2/day. JRCC has completed five wells in the subcoal Fort Union Formation to supply water to the Jacobs Ranch Mine. The wells range in depth from 645 to 1,804 feet. The Jacobs Ranch Mine supply wells are depicted on Figure 3-7.

The water quality of the Fort Union Formation is generally good. TDS concentrations measured at Jacobs Ranch Facility Well JRM #16 average 340 mg/L. Water from this well is of the sodium bicarbonate type.

Lance and Fox Hills Formations

Underlying the Fort Union Formation is the Lance Formation of Cretaceous age. At the base of the Lance Formation is the Fox Hills Sandstone. The Lance and Fox Hills Formations are not used by JRCC at the Jacobs Ranch Mine.

3.6.2 Surface Water

The area surrounding the North Jacobs Ranch LBA Tract consists of gently rolling topography. In general, the streams within this area are typical for the region, and their flow events are closely reflective of precipitation patterns. Flow events frequently result from snowmelt during the late winter and early spring. Although peak discharges from such events are generally small, the duration and therefore percentage of annual runoff volume can be considerable. During the spring, general storms (both rain and snow) increase soil moisture, hence decreasing infiltration capacity, and subsequent rainstorms can result in both large runoff volumes and high peak discharges. The surface water quality varies with streamflow rate; the higher the flow rate, the lower the TDS concentration but the higher the suspended solids concentration. Surface water features within and adjacent to the North Jacobs Ranch LBA Tract are displayed in Figure 3-8.

The only streams within the LBA Tract are Mills Draw and Shipley Draw. These two streams are classified as ephemeral, meaning they flow only in direct response to snowmelt or precipitation runoff events. Mills Draw and Shipley Draw flow in a southerly direction within the North Jacobs Ranch LBA Tract. Only the upper reaches of these two ephemeral streams lie within the LBA Tract. The topography within these two drainage basins is characterized by very gentle slopes and the stream channels are grassy swales.

Mills and Shipley Draws join approximately 2 to 3 miles downstream of the North Jacobs Ranch LBA Tract and under premining conditions flowed into the North Prong Little Thunder Creek. North Prong Little Thunder Creek, Mills Draw and Shipley Draw have been diverted around mining operations at the Black Thunder Mine. The premining drainage area of Mills Draw is approximately 5.5 square miles and the mean annual runoff is roughly 50 acre-feet. The premining drainage area of Shipley Draw is approximately 3.0 square miles and the mean annual runoff is roughly 30 acre-feet. The mean annual runoff calculations were performed using relationships developed by Hadley and Schumm (1961).

The lower reaches of Mills Draw and Shipley Draw lie within the adjacent Thundercloud lease. The Thundercloud lease is contiguous to and south of the North Jacobs Ranch LBA Tract and contiguous to and west of the Jacobs Ranch Mine permit area. North Prong Little Thunder Creek flows easterly near the southern edge of the Thundercloud lease, joining Little Thunder Creek just downstream from the Jacobs Ranch Mine. Little Thunder Creek also joins Black Thunder Creek, a tributary of the Cheyenne River. Historically, North Prong Little Thunder Creek has exhibited infrequent streamflow events, generally with discharges of less than five ft^3 per second. Mills and Shipley Draws are the main streams which contribute streamflow to North Prong Little Thunder Creek in the Thundercloud lease.

A significant portion of the North Jacobs Ranch LBA Tract lies within closed drainage basins which do not contribute runoff to streams except possibly during extremely large and rare storm events. These playas, which predominate the land area within the LBA Tract east of the Mills and Shipley Draw drainage divides, are hydrologically significant in that they do not contribute runoff to area streams. The water that is stored in

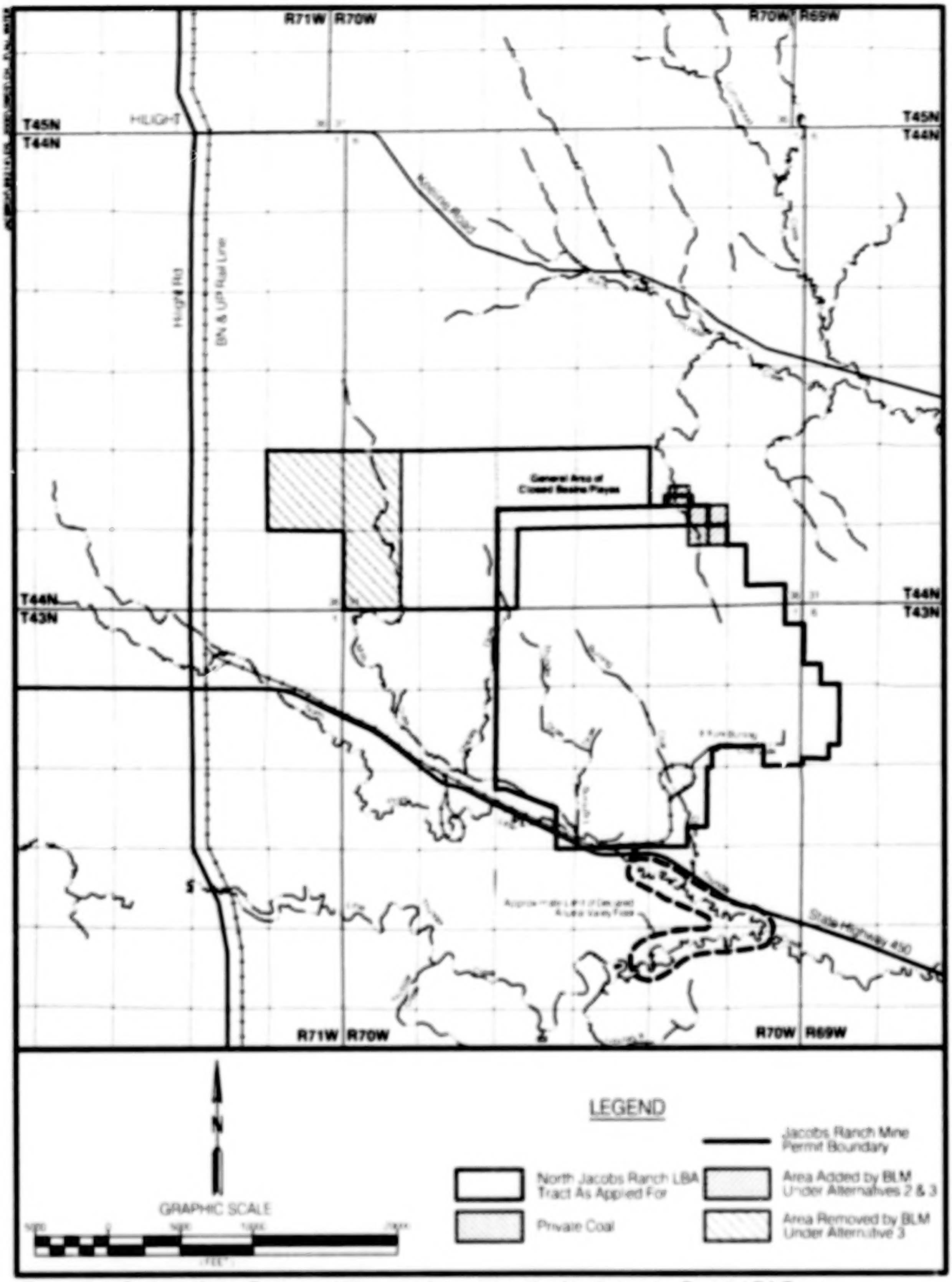
R71W R70W
R70W R69W
T45N
T44N
T43N
HILIGHT
Hilight Rd
BN & UP Rail Line
Reno Road
General Area of Closed Basins Playas
State Highway 450
LEGEND
Jacobs Ranch Mine Permit Boundary
North Jacobs Ranch LBA Tract As Applied For
Area Added by BLM Under Alternatives 2 & 3
Private Coal
Area Removed by BLM Under Alternative 3
N
GRAPHIC SCALE
FEET

Figure 3-8. Surface Water Features Within and Adjacent to the North Jacobs Ranch LBA Tract

the playas is consumed by evapotranspiration and seepage.

Flows and water quality are monitored by the Jacobs Ranch and Black Thunder Mines in the North Prong Little Thunder Creek and Little Thunder Creek as well as several minor tributaries on and near the LBA Tract. These monitoring results are reported to the WDEQ/LQD annually. Most local surface waters are a sodium or calcium sulfate-type that exceeds WDEQ domestic use standards for arsenic, manganese, and TDS depending on flow rate and sample location (KMCC 1993; TBCC 1992). Surface water quality is usually unsuitable for domestic use, marginal for irrigation, and suitable for stock and wildlife.

3.6.3 Water Rights

Records of the SEO were searched for groundwater rights within a 3-mile radius of the North Jacobs Ranch LBA Tract as applied for under the Proposed Action and Alternative 2. This information is required for WDEQ permitting. SEO data indicate there are 368 permitted water wells within three miles of the tract, of which 192 are owned by coal mining companies. Of the 176 other wells, 56 are permitted for stock watering only, 45 are permitted for both CBM development and stock watering, 34 are permitted for CBM development only, 28 are permitted for monitoring or miscellaneous uses, eight are permitted for either stock or domestic use, two are for domestic use only, two are for industrial use, and one is permitted for irrigation use. A listing of the 176 non-coal mine wells is presented in Appendix E.

SEO records were searched for surface water rights using the SEO's AREV program. The search was conducted for surface-water rights within one-half mile of the tract and three miles downstream from the LBA Tract as applied for and Alternative 2, as required for WDEQ permitting.

SEO records indicate 23 permitted surface water rights within the search area. Ten of the surface water rights are held by coal mining companies. The 13 other surface water rights are for stock watering, irrigation and domestic use. A listing of the 13 non-coal mine surface water rights is included in Appendix E.

3.7 Alluvial Valley Floors

WDEQ regulations define AVF's as unconsolidated stream laid deposits where water availability is sufficient for subirrigation or flood irrigation agricultural activities. Prior to leasing and mining, AVF's must be identified because SMCRA restricts mining activities which affect AVF's that are determined to be significant to agriculture. Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. If the AVF is determined not to be significant to agriculture, or if the permit to affect the AVF was issued prior to the effective date of SMCRA, the AVF can be disturbed during mining but must be restored as part of the reclamation process. The determination of significance to agriculture is made by

WDEQ/LQD, and it is based on specific calculations related to the production of crops or forage on the AVF and the size of the existing agricultural operations on the land of which the AVF is a part.

Investigations have been conducted by JRCC to determine the presence of AVF's within and surrounding the Jacobs Ranch Mine. The investigations concluded, and the WDEQ concurred, that there are no AVF's within and surrounding the permit area of Jacobs Ranch Mine. The conclusion included the finding that the lower reaches of Mills and Shipley Draws within the Thundercloud lease are not AVF's. The nearest declared AVF is downstream from the Jacobs Ranch Mine near the confluence of North Prong Little Thunder Creek and Little Thunder Creek (Figure 3-8). Specific declarations of the presence or absence of AVF's on the LBA Tract will be made by WDEQ if the lease is sold and a mine permit is acquired.

There is no present or historical record of agricultural use, other than undeveloped rangeland, of the streamlaid deposits within the North Jacobs Ranch LBA Tract. If WDEQ determines that an AVF is present (which is unlikely given the fact that the lower reaches of Mills and Shipley Draws are not AVF's) on the tract, it is reasonable to assume that mining would be permitted in those areas because the lack of agricultural development in this area precludes a determination of significance to agriculture.

3.8 Wetlands

Waters of the U.S. is a collective term for all areas subject to regulation by the COE under Section 404 of the Clean Water Act. *Waters of the U.S.* include *special aquatic sites*, wetlands, and jurisdictional wetlands. *Special aquatic sites* are large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of *special aquatic site* which include "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (33 CFR 328.3(a)(7)(b)). Jurisdictional wetlands are defined by 33 CFR 328.1 and .2 as "those wetlands which are within the extent of COE regulatory review." They must contain three components: hydric soils, a dominance of hydrophytic plants, and wetland hydrology.

Many wetland scientists consider areas that contain only one of the three criteria listed above as functional wetlands. The USFWS used this categorization in producing the National Wetlands Inventory maps. These maps were produced using aerial photo interpretation, with limited field verification.

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The presence of jurisdictional wetlands on a mine property does not preclude mining. Jurisdictional wetlands must be identified and special permitting procedures are required to assure that after mining there will be no net loss of wetlands. A wetland delineation must be completed according to approved procedures (COE 1987) and submitted to the COE for verification as to the amounts and types of jurisdictional wetlands present. In Wyoming, once the delineation has been verified, it is made a part of the mine permit document. The reclamation plan is then revised to incorporate at least an equal type and number of jurisdictional wetlands. Section 404 does not cover functional wetlands. They may be restored as required by the surface managing agency (on public land) or by the private landowner. There is no public land included in the North Jacobs Ranch LBA Tract.

Jurisdictional wetland inventories were completed in 1999 by Kennecott Energy on lands contained within the North Jacobs Ranch LBA Tract as applied for and Alternatives 2 and 3. The wetlands delineation was completed in accordance with the procedures and criteria contained in the COE 1987 Wetland Delineation Manual. A total of 61.37 acres of waters of the U.S. have been identified, of which 52.32 acres are jurisdictional wetlands. There is an additional 1.25 acres of non-jurisdictional wetlands also contained in the tract that include stockpond and roadside wetlands. Identified jurisdictional wetlands include playas (43.28 acres), manmade stockponds (6.87 acres) and portions of ephemeral stream channels (2.17 acres). The additional 9.05 acres of waters of the U.S., which did not qualify as jurisdictional wetlands, include stockponds (6.51 acres) and ephemeral stream channels (2.54 acres). These sites did not possess wetland characteristics because they pond water or contain water for insufficient periods of time.

3.9 Vegetation

A vegetation baseline study was completed by Kennecott Energy within and adjacent to the lands contained within the North Jacobs Ranch LBA Tract as applied for under the Proposed Action and Alternatives 2 and 3 in 1999. The baseline study area is located north and northwest of the Jacobs Ranch Mine permit boundary. The vegetation communities in this area were delineated, mapped and sampled in accordance with the current WDEQ/LQD requirements. The vegetation study areas include the LBA Tract as applied for, Alternatives 2 and 3, and a buffer area around the tract sufficient to mine and reclaim the tract as a part of the existing mine operation.

A total of 11 vegetation types have been preliminarily identified and mapped within the LBA Tract as applied for and Alternatives 2 and 3. Table 3-6 presents the acreage and percent of the area encompassed by each vegetation type. The vegetation types include Big Sagebrush Shrubland, Crested Wheatgrass,

Table 3-6. Vegetation Types Identified and Mapped Within the North Jacobs Ranch LBA Tract Baseline Study Area.

Vegetation Type	Acres	Percent of Area
Big Sagebrush Shrubland	2218.3	44.17
Crested Wheatgrass	1133.7	22.57
Upland Grassland	709.2	14.12
Cultivated (Crested Wheatgrass Pasturelands)	658.0	13.10
Playa Grassland	90.3	1.80
Disturbed Land	90.3	1.80
Playa Wetland	43.3	0.86
Mixed Shrub	33.6	0.67
Bottomland Grassland	21.8	0.43
Reservoir	16.3	0.32
Rough Breaks	7.9	0.16
Total	5022.7	100.00

Cultivated, Upland Grassland, Playa Grassland, Disturbed Lands, Playa Wetlands, Mixed Shrub, Bottomland Grassland, Reservoir and Rough Breaks. These vegetation types are described as follows:

The **Big Sagebrush Shrubland** vegetation type is the largest mapping unit identified within the LBA Tract, occupying approximately 2,218.3 acres, or 44.17 percent of the tract's area. This vegetation type typically occurs in upland positions throughout the study area. Major perennial species include big sagebrush (Artemisia tridentata), western wheatgrass (Agropyron smithii), prairie junegrass (Koeleria macrantha) and blue grama (Bouteloua gracilis). Annual species that are common on this vegetation type include Japanese chess (Bromus japonicus) and cheatgrass brome (Bromus tectorum).

The **Crested Wheatgrass** vegetation type is the second largest mapping unit comprising approximately 1133.7 acres, or 22.57 percent of the area. This vegetation type occurs throughout the study area. Crested wheatgrass (Agropyron cristatum) was the most common perennial species recorded on this vegetation type. Needleandthread (Stipa comata), red threeawn (Aristida longiseta) and blue grama were also common perennial grasses recorded on this vegetation type. Common annual species recorded on this vegetation type include cheatgrass brome and sixweeksgrass (Vulpia octoflora).

The **Upland Grassland** vegetation type makes up approximately 709.2 acres or about 14.12 percent of the study area and is found throughout the LBA Tract. This vegetation type is dominated primarily by perennial grasses, which include needleandthread, western wheatgrass, blue grama and prairie junegrass. Common annual species include cheatgrass brome, Japanese brome and fluffweed (Filago arvensis).

The **Cultivated** vegetation type occurs throughout the study area and makes up approximately 658.0 acres, or 13.10 percent of the study area. Common species for this vegetation type include crested wheatgrass and alfalfa (Medicago sativa).

The **Playa Grassland** vegetation type was mapped on approximately 90.3 acres or about 1.80 percent of the study area. The dominant species on these playas is western wheatgrass. Spikerush (Eleocharis spp.), foxtail barley (Hordeum jubatum) and dandelion (Taraxacum officinale) was also present.

The **Disturbed Lands** type made up approximately 90.3 acres (1.80 percent of the study area). This type is made up of past disturbance from oil and gas production in the area.

The **Playa Wetlands** vegetation type on the LBA Tract area makes up approximately 43.3 acres, or about 0.86 percent of the study area. Dominant species are spikerush and foxtail barley.

The **Mixed Shrub** vegetation type makes up approximately 33.6 acres, or about 0.67 percent of the study area. This map unit was dominated by western wheatgrass, big sagebrush, Sandberg bluegrass (Poa secunda) and black greasewood (Sarcobatus vermiculatus).

The **Bottomland Grassland** vegetation type makes up approximately 21.8 acres, or about 0.43 percent of the LBA Tract study area. The most common species recorded on this vegetation type include: western wheatgrass, Kentucky bluegrass (Poa pratensis), green needlegrass (Stipa viridula) and inland saltgrass (Distichlis stricta).

The **Reservoir** map unit occupies approximately 16.3 acres, or about 0.32 percent of the study area.

The **Rough Breaks** vegetation type on the LBA Tract makes up approximately 7.9 acres or about 0.16 percent of the total study area. Dominant plant species found on this vegetation type include big sagebrush, bluebunch wheatgrass (Agropyron spicatum) and western wheatgrass.

Threatened, Endangered, and Candidate Plant Species

Refer to Appendix F.

3.10 Wildlife

3.10.1 Wildlife Resources

Background information on wildlife in the vicinity of the North Jacobs Ranch LBA Tract was drawn from several sources including: Thundercloud coal lease application (BLM 1998), WGFD and USFWS records and personnel contacts with WGFD and USFWS biologists.

Site-specific data for the entire proposed LBA lease area were obtained from sources including WDEQ/LQD permit applications and annual reports for nearby mines. Baseline and monitoring surveys cover large perimeters around each mine's permit area. Consequently, a majority of the LBA Tract has been surveyed during annual wildlife monitoring for the Jacobs Ranch Mine. The eastern half of the North Jacobs Ranch LBA Tract has been monitored by the Jacobs Ranch Mine annually for the past 12 years. The western half of the tract has been monitored by the Jacobs Ranch Mine annually for the last five years. The entire area of the North Jacobs Ranch LBA Tract under the Proposed Action and the alternative configurations has undergone a wildlife survey, which was conducted in January through August of 1999.

The LBA Tract and adjacent area consists primarily of uplands. The topography is level to rolling, with some areas sloping to steeply sloping. Big sagebrush shrubland habitat dominates the tract. This habitat is characterized by level ground to rolling hills that are well vegetated. Crested wheatgrass and upland grassland habitats also occur within the LBA Tract. Bottomland grassland habitat types are found on the LBA Tract along drainage channels. All streams on the LBA Tract are ephemeral. Several ponds exist on the LBA Tract, most of them being stock ponds and a few playa lakes. The majority of the trees on the tract were planted around ranch buildings. Other isolated trees exist on the tract along drainages.

3.10.2 Big Game

Three big game species occur in the vicinity of the LBA Tract: pronghorn (Antilocapra americana), mule deer (Odocoileus hemionus),) and elk (Cervus elaphus). WGFD big game herd unit maps show this area is out of the normal white-tailed deer (Odocoileus virginianus) range. The WGFD has classified the entire tract as yearlong pronghorn range. The majority of the tract is classified as yearlong deer range. No crucial big game habitat or migration corridors are recognized by the WGFD in this area.

Pronghorn are by far the most common big game species in the area. The LBA Tract is within the Hilight Herd Unit with approximately 2,909 acres of the proposed lease area within yearlong range and the remaining 1,912.2 acres within winter-yearlong range. None of the area within two miles has been classified as crucial or critical pronghorn habitat. Data obtained for the Hilight Herd Unit indicate the WGFD estimated population averaged approximately 17 animals per mi^2 of occupied habitat from 1980 through 1995. The yearly big game monitoring surveys completed for the adjacent Jacobs Ranch Mine also covered a majority of the LBA Tract. The Jacobs Ranch Mine surveys averaged 11 pronghorn per mi^2 for the same period of 1980 through 1995. This indicates that pronghorn numbers are lower in this portion of the herd unit.

The North Jacobs Ranch LBA Tract is located within the western portion of the WGFD Thunder Basin Mule Deer Herd Unit. The WGFD maps show the proposed lease area includes approximately 3,374.7 acres of yearlong mule deer range and 1,446.5 acres of land which are generally out of normal use areas. Crucial or critical mule deer ranges do not occur on or within several miles of the proposed permit area. WGFD data from 1980 through 1995 for the entire herd unit show an average of 4 animals per mi^2 of occupied habitat while data collected by Jacobs Ranch Mine averaged less than one mule deer per mi^2 for the same period. The low densities exhibited by the mines' monitoring data reflect the fact that a good portion of the LBA Tract is classified by WGFD as not being within normal mule deer use areas.

The North Jacobs Ranch LBA Tract is not generally considered by WGFD to be an elk use area, but several elk have been recorded on the eastern portion of the LBA Tract over the past several years. Elk have been observed spending time wintering on adjacent grasslands southeast of the LBA Tract in recent years. None of the lease area or areas within two miles have been classified as crucial or critical elk habitat. The nearest crucial elk habitat is just over 2 miles to the southeast on Jacobs Ranch Mine reclaimed areas. The WGFD (Oedekoven 1994) has designated an approximately five square mile area on reclaimed or adjacent lands as crucial winter habitat for the Rochelle Hills elk herd.

3.10.3 Other Mammals

A variety of small and medium-sized mammal species occur in the vicinity of the LBA Tract. These include predators and furbearers, such as coyote (Canis latrans), red fox (Vulpes vulpes), striped skunk (Mephitis mephitis) and raccoon (Procyon lotor). Prey species include rodents (such as mice, voles, chipmunks and prairie dogs) and lagomorphs (jackrabbits and cottontails). Surveys for prairie dog towns were conducted on the LBA Tract and adjacent lands. No prairie dog towns were observed on the LBA Tract. The closest prairie dog town to the LBA Tract is located in the NE1/4 SE1/4 of Section 23 and the NW1/4 SW1/4 of Section 24 T43N, R71N. A second prairie dog town located near the LBA Tract is found in the NW1/4 SW1/4 of Section 26 T44N, R71W. Several other prairie dog towns are known to exist approximately four miles south of the LBA Tract. Prairie dog towns within the vicinity of the LBA Tract are shown on Figure 3-9. These species are cyclically common and widespread throughout the region. They are important prey items for raptors and other predators.

3.10.4 Raptors

Numerous raptor species have been observed on or adjacent to the North Jacobs Ranch LBA Tract. These species include the golden eagle (Aquila chrysaetos), bald eagle (Haliaeetus leucocephalus), northern harrier (Circus cyaneus), Swainson's

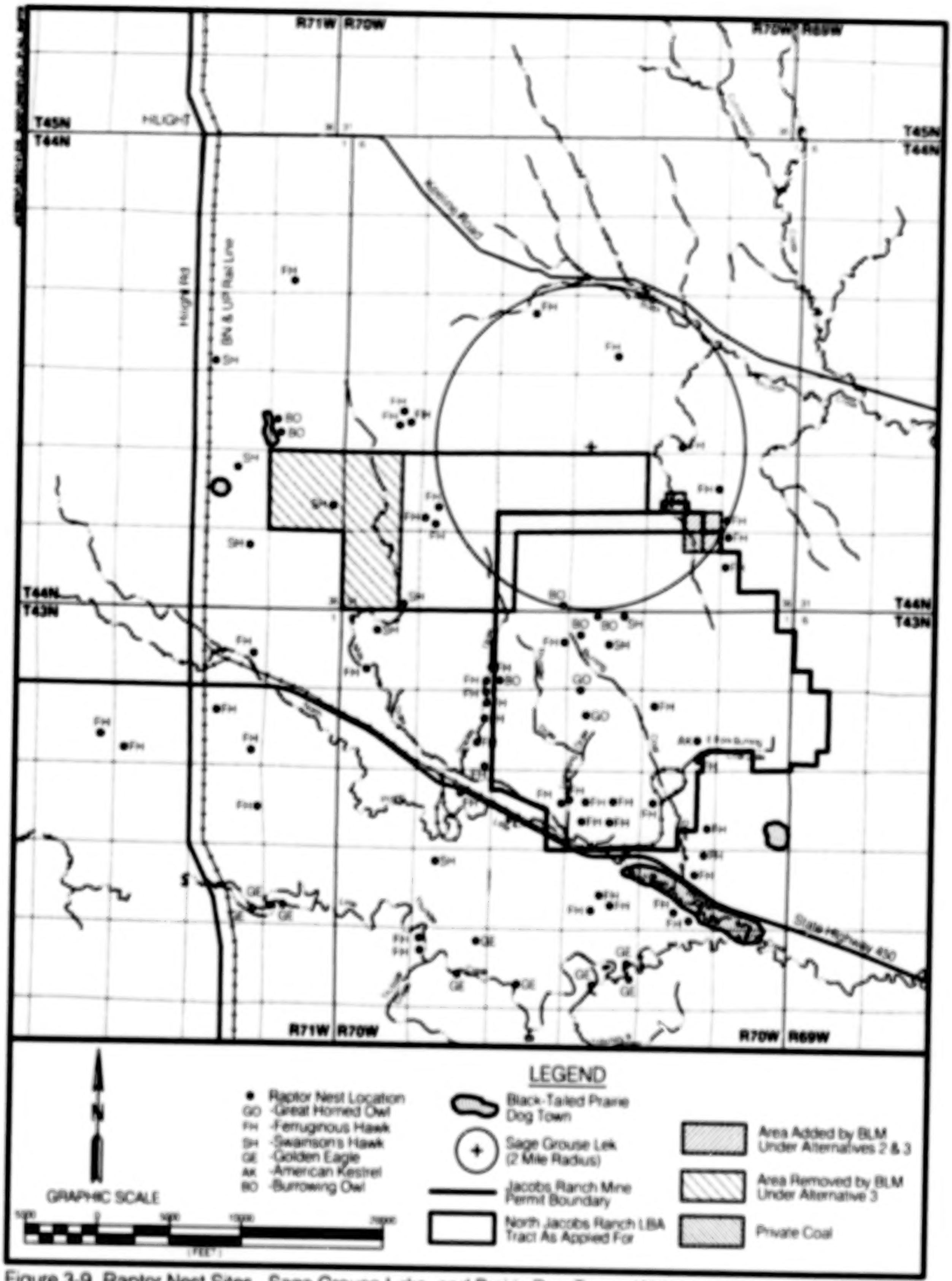

Figure 3-9. Raptor Nest Sites, Sage Grouse Leks, and Prairie Dog Towns Within and Adjacent to the North Jacobs Ranch LBA Tract.

hawk (Buteo swainsoni), red-tailed hawk (Buteo jamaicensis), ferruginous hawk (Buteo regalis), rough-legged hawk (Buteo lagopus), prairie falcon (Falco peregrinus), American kestrel (Falco sparverius), turkey vulture (Carthartes aura), great horned owl (Bubo virginianus), short-eared owl (Asio flammeus) and burrowing owl (Athene cunicularia). Although numerous raptor species have been observed in the area, very few nested on or near the site due to the lack of suitable nesting habitat (cliffs and tall trees). Figure 3-9 shows the locations of raptor nest sites that have been identified since monitoring began for Jacobs Ranch Mine in an area which includes the North Jacobs Ranch LBA Tract. The figure shows a total of 44 nest sites. As of 1999, 26 of those nest sites were still intact but only represented 17 pairs of birds because many had alternate nest sites. Of the 18 nest sites that were no longer present, 16 were destroyed by natural events and 2 were removed by mining activities. Five of the intact nest sites were created to mitigate other sites impacted by mining by the surrounding mining companies. These sites consist of either platforms or nests placed on rock piles or on the ground for ferruginous hawks. A total of five raptor species have been identified nesting within two miles of the LBA Tract. These species include the burrowing owl, great horned owl, ferruginous hawk, Swainson's hawk and American kestrel. In 1999, only five nest sites were active and included one ferruginous hawk nest, two Swainson's hawk nests and two burrowing owl nests. Only two raptor species have been recorded nesting on the LBA Tract. The ferruginous hawk had the most nest sites, but all of those nests belonged to the same pair of birds.

The LBA Tract and lands within one mile do not contain trees large enough to support an eagle nest. Cliffs also do not occur within the area, so falcon nesting habitat is not present.

3.10.5 Game Birds

Several upland bird species have been observed on the North Jacobs Ranch LBA Tract or adjacent areas, including sage grouse (Centrocercus urophasianus) and migratory mourning doves (Zenaida macroura). Based on field observations, the mourning dove was the most common of the two species. The mourning dove only inhabits the area for breeding and reproduction from late spring to early fall.

The sage grouse is a yearlong resident and was found on lands adjacent to the LBA Tract. Sage grouse lek surveys in April and May of 1999 found an active sage grouse strutting ground within two miles of the LBA Tract. Figure 3-9 shows the location of this active lek with a two-mile radius which research identified as the area in which most hens will nest. The lek is located in the SW1/4 of Section 22, T44N, R70W. This particular lek was active from 1993 through 1999 with the maximum number of males recorded at 27 in 1999.

Sage grouse brood surveys were conducted on the LBA Tract along ephemeral stream drainages in July of 1999. These surveys covered approximately two miles. Adult sage grouse or broods were not observed during the 1999 survey. However, three broods of eight, eight, and three, respectively, were observed east of the LBA Tract area. Two biologists spent a total of 12 man-days in July 1999 conducting various surveys on the LBA Tract. Sage grouse were rarely observed on the study area during surveys completed during 1999 but were observed on lands adjacent to the North Jacobs Ranch LBA Tract.

3.10.6 Migratory Birds of High Federal Interest

Table 3-7 provides a list of the MBHFI species that may occur on the North Jacobs Ranch LBA Tract or disturbance areas. Thirteen MBHFI species have been documented in the area. The ferruginous hawk nests in the area, generally using ground nests. The golden eagle does not have nesting habitat on or within one mile of the LBA Tract but frequents the site in search of prey. The bald eagle is a common winter resident but does not nest in the area due to lack of suitable habitat. The other MBHFI species observed on the area were recorded as migrants or foraging in the area, and nesting habitat for several of those species occurs on the tract.

3.10.7 Other Species

Wildlife surveys completed specifically for the North Jacobs Ranch LBA Tract, and surveys completed for the adjacent mines, have documented numerous other wildlife species that inhabit the area. All of these species were generally common inhabitants of the area and none were of specific concern to state or federal agencies. The other species observed include eight carnivores, 19 rodents, five lagomorphs, 61 waterbirds, 13 raptors, 59 other bird species and 11 herptiles.

Under current natural conditions the LBA Tract provides limited waterfowl and shorebird habitat. This habitat is primarily provided during spring migration as ponds, playas and ephemeral streams. These waterbodies generally dry up during the summer. The Hansen Lakes, which are found within the northern part of the LBA Tract, can sustain waterfowl and shorebird populations in a very wet year but during most years these lakes dry up during the summer and are always dry by fall. With the addition of produced water from CBM wells in the area, an increase in habitat for waterfowl and shorebirds may occur if sufficient water is produced to fill ponds and drainages.

Fish species are not normally found on the LBA Tract as all bodies of water and perennial flows are established from CBM discharges. For fish species to migrate up Mills Draw and Shipley Draw from the North Prong and survive, the CBM

Table 3-7. MBHFI Status in Northeast Wyoming and Expected Occurrence on or near the North Jacobs Ranch LBA Tract.

Species	**Seasonal Status/Breeding Records in NE Wyoming**[1]	**Documented on or near the LBA Tract**	**Expected in the LBA Tract**
Common Loon	Summer/nonbreeder	No	Uncommon
American Bittern	Summer/nonbreeder	No	Uncommon
White-faced Ibis	Summer/nonbreeder	No	Uncommon
Northern Harrier	Summer/breeder	Yes	Common
Ferruginous Hawk	Summer/breeder	Yes	Common
Mountain Plover	Resident/breeder	No	Uncommon
Upland Sandpiper	Summer/breeder	Yes	Uncommon
Long-billed Curlew	Resident/breeder	Yes	Uncommon
Black Tern	Resident/breeder	Yes	Uncommon
Barn Owl	Never recorded	No	Very rare
Burrowing Owl	Summer/breeder	Yes	Uncommon
Short-eared Owl	Summer/breeder	Yes	Occasional
Veery	Summer/breeder	No	Uncommon
Loggerhead Shrike	Summer/breeder	Yes	Common
Dickcissel	Summer/breeder	No	Rare
Cassin's Sparrow	Summer/breeder	No	Rare
Baird's Sparrow	Summer/breeder	No	Uncommon
Brewer's Sparrow	Summer/breeder	Yes	Common
Lark Bunting	Summer/breeder	Yes	Common
Grasshopper Sparrow	Summer/breeder	Yes	Common
McCown's Longspur	Summer/breeder	Yes	Common
Chestnut-collared Longspur	Summer/breeder	Yes	uncommon

[1] Compiled from Oakleaf et al. (1997). Includes Campbell County and adjacent counties.

wells must produce sufficient and perennial flows of water. There would not be the possibility of any sensitive fish species migrating onto the LBA Tract since they are not known to exist downstream within a reasonable distance.

3.10.8 Threatened, Endangered and Candidate Animal Species

Refer to Appendix F.

3.11 Ownership and Use of Land

The surface on the North Jacobs Ranch LBA Tract as applied for and under the Alternative 2 configuration is owned by Jacobs Land and Livestock Company, Ark Land Company, and Ken and Sylvia Revland (Figure 3-10). The principal land use of the area within the tract is domestic grazing and wildlife habitat (JRCC 1998). Secondary land use is oil and gas production.

Areas of disturbance within the North Jacobs Ranch LBA Tract include oil and gas wells and the disturbances associated with oil and gas production. There are numerous bladed oil field roads and buried oil and gas pipelines in and near the tract. The original Jacobs Ranch ranching headquarters and support facilities are located in the north-central part of the tract. Portions of three county roads, the Small Road, the Jacobs Road, and the Little Thunder Road, pass through the LBA Tract.

The oil and gas rights within the North Jacobs Ranch LBA Tract as applied for are both federally and privately owned (Figure 3-11). The majority (about 61 percent) are federal. The federally owned oil and gas rights included in the tract are leased, and a list of the lessees of record for those federal oil and gas leases is included as Table 3-8.

Twenty-nine wells have been drilled and completed as producing oil and gas wells on the LBA Tract as applied for under the Proposed Action. Of these, 21 wells are currently producing and 8 have been permanently abandoned or shut in (Figure 3-11). Fourteen of these 21 producing wells are on federal oil and gas leases. Twenty-five wells have been drilled and completed as producing oil and gas wells on lands under the Alternative 2 configuration. Of these, 18 wells are currently producing and 7 have been permanently abandoned or shut in. Fourteen of these 18 producing wells are on federal oil and gas leases.

Seventeen wells have been drilled and completed as producing oil and gas wells on lands under the Alternative 3 configuration. Of these, 12 wells are currently producing and 5 have been permanently abandoned or shut in. Eight of these 12 producing wells are on federal oil and gas leases.

All of these conventional oil and gas wells, which were originally drilled between 1970 and 1971, produce from the Lower Cretaceous Muddy Sandstone Member (WOGCC 2000).

The Supreme Court has ruled that the CBM rights belong to the owner of

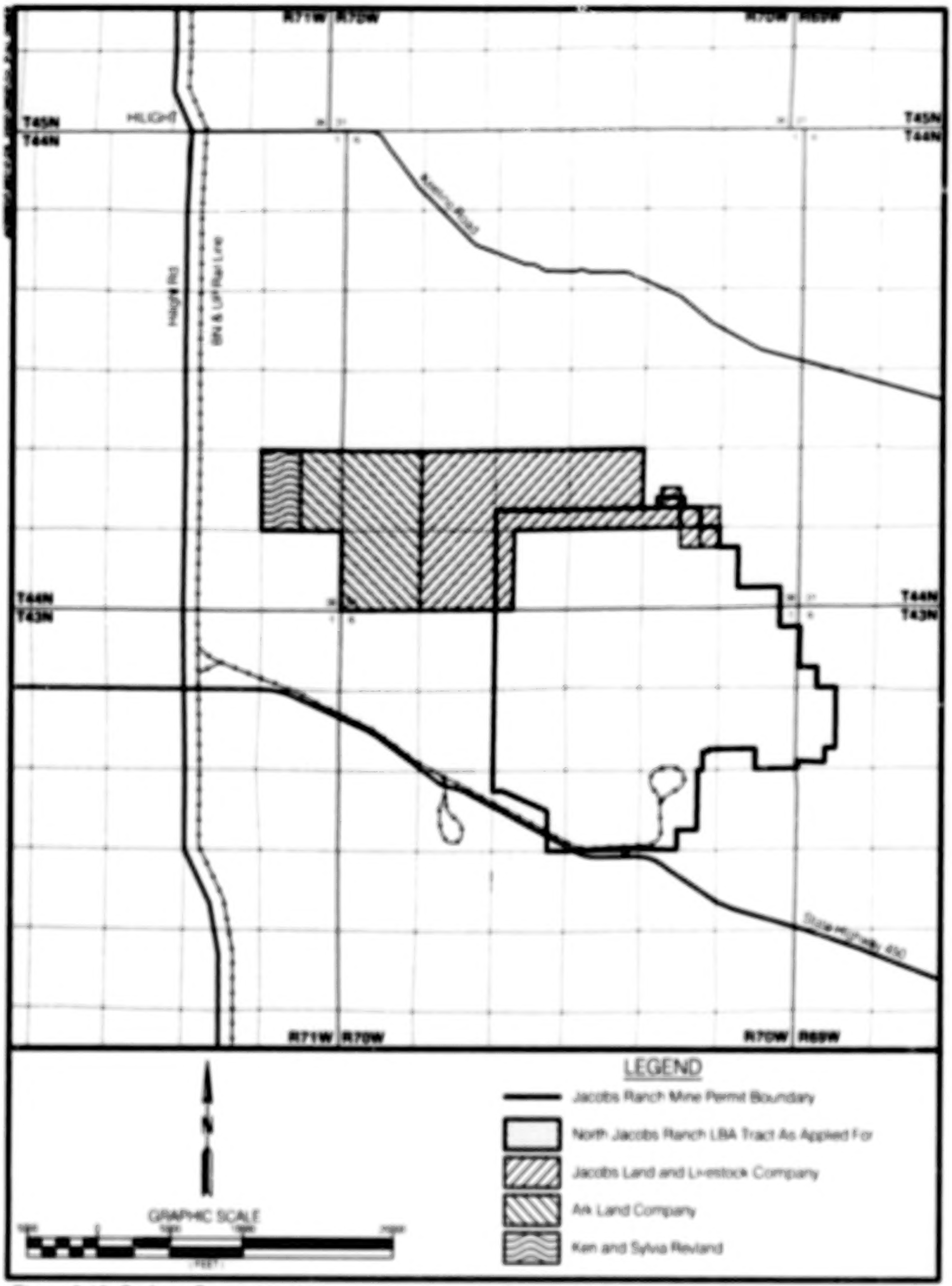

Figure 3-10. Surface Ownership Within the North Jacobs Ranch LBA Tract

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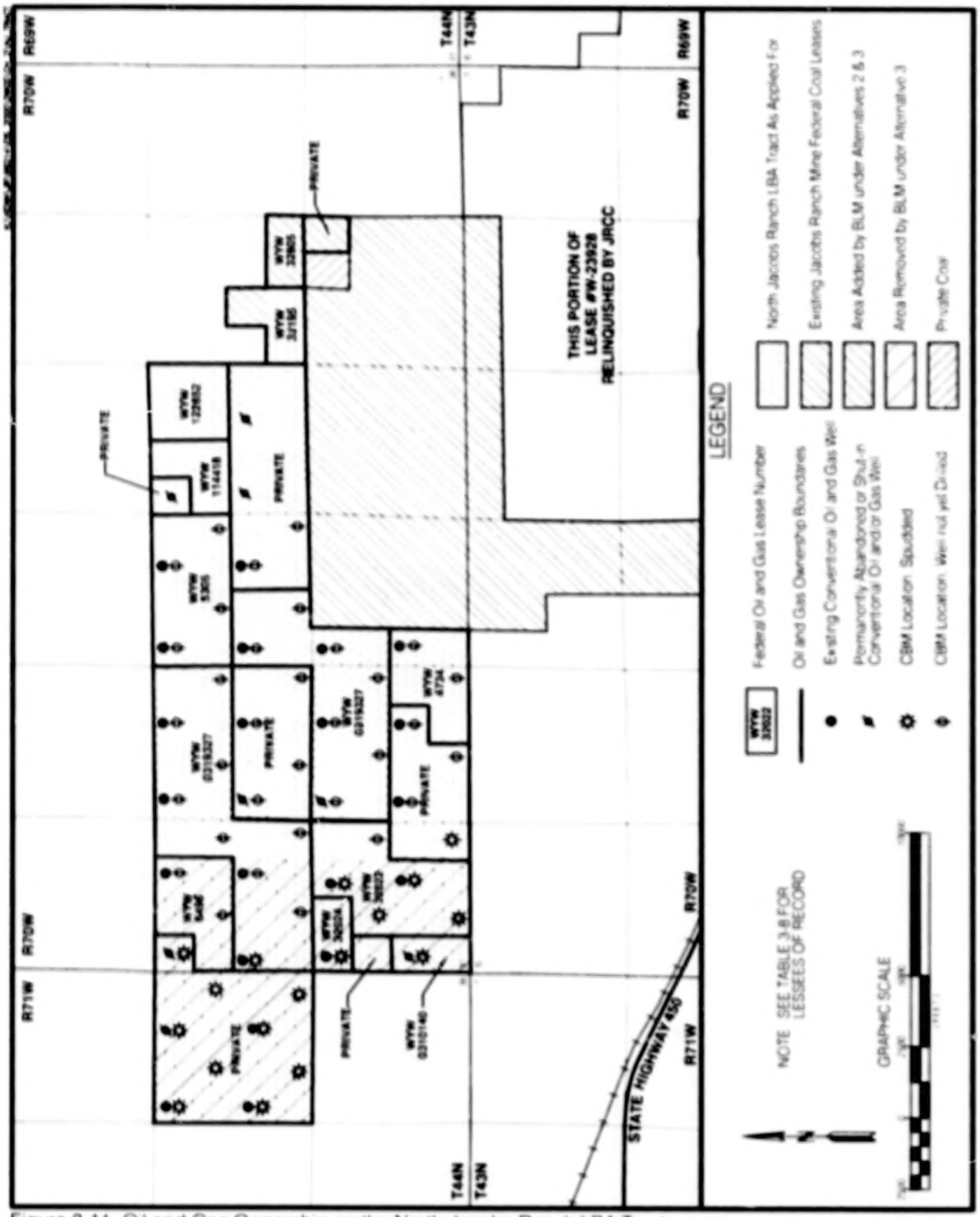

R71W
R70W
R70W
R69W
PRIVATE
WYW 5496
WYW 0319327
WYW 5305
PRIVATE
WYW 114418
WYW 122652
PRIVATE
PRIVATE
PRIVATE
WYW 32195
WYW 32805
PRIVATE
PRIVATE
WYW 32024
WYW 32022
WYW 0319327
WYW 0310140
PRIVATE
WYW 4734
T44N
T43N
T44N
T43N
THIS PORTION OF LEASE #W-23928 RELINQUISHED BY JRCC
STATE HIGHWAY 450
R71W
R70W
R70W
R69W
LEGEND
WYW 32022
Federal Oil and Gas Lease Number
Oil and Gas Ownership Boundaries
Existing Conventional Oil and Gas Well
Permanently Abandoned or Shut-in Conventional Oil and/or Gas Well
CBM Location: Spudded
CBM Location: Well not yet Drilled
North Jacobs Ranch LBA Tract As Applied For
Existing Jacobs Ranch Mine Federal Coal Leases
Area Added by BLM under Alternatives 2 & 3
Area Removed by BLM under Alternative 3
Private Coal
N
NOTE: SEE TABLE 3-8 FOR LESSEES OF RECORD
GRAPHIC SCALE
FEET

Figure 3-11. Oil and Gas Ownership on the North Jacobs Ranch LBA Tract

Table 3-8. North Jacobs Ranch LBA Tract Oil and Gas Ownership.

For the following locations, both the oil and gas rights (including coal bed methane) and coal rights are owned by the federal government.

Location	Lease Number	Lessees of Record
T. 44 N., R. 70 W.		
Section 26 Lots 8, 9, 10	WYW 32195	APD Energy Co. Citation 1994 Investment Davis Oil Co Hunt Oil Co. George C. Kennedy Key Production Co. Langham Petroleum Exp. Oilfield Salvage Co. PIP Energy IV-80 Tom Brown Inc. Dean Unruh
Section 26 Lots 11, 12	WYW 32805	Citation 1994 Investment Hunt Oil Co. Key Production Co. Pacific Enterprises Oil Co. Tom Brown, Inc.
Section 27 Lots 1, 2, 7, 8	WYW 122652	Lasmo Oil & Gas Inc. Louisiana Land & Exploration
Section 27 Lots 3, 5, 6	WYW 114418	John Behrmann
Section 28 Lots 1-8	WYW 5305	Citation 1994 Investment Key Production Co. M&K Oil Co. Inc.
Section 28 Lots 11-14 Section 29 Lots 1-8 Section 30 Lots 5, 12-20 Section 32 Lots 1-8 Section 33 Lots 4, 5	WYW 0319327	Key Production Co. Richard K. Lisco M&K Oil Co. Inc.
Section 30 Lots 6, 7, 9, 10, 11	WYW 6496	Richard K. Lisco Wellstar Corporation
Section 31 Lots 5, 6, 10, 11, 12, 14, 15, 18, 19	WYW 32022	Inexco Oil Co. Merit Energy Partners Merit Energy Partners III
Section 31 Lots 7, 8	WYW 32024	M&K Oil Co. Inc. Perry R. Bass Inc. Questar Exploration & Production Co.
Section 31 Lots 16, 17	WYW 0310140	M&K Oil Co. Inc. Perry R. Bass Inc. Questar Exploration & Production Co.
Section 32 Lots 9, 10, 15, 16 Section 33 Lots 12, 13	WYW 4734	Citation 1994 Investments Key Production Co Inc. M&K Oil Co. Inc.

Note: For the rest of the LBA Tract, the oil and gas rights (including coal bed methane) are privately owned. All of the coal rights are federally owned.

the oil and gas rights (98-830). Therefore, the oil and gas lessees have the mineral rights to develop the CBM in the coal on the tract as well as the mineral rights to develop conventional oil and gas resources on the tract.

CBM resources are currently being evaluated on the North Jacobs Ranch LBA tract. The WOGCC recently approved a well spacing pattern of one well per 80 acres for development of CBM resources in the PRB. Under the Proposed Action, there would potentially be 58 CBM well locations on the North Jacobs Ranch LBA tract if all of the 80-acre spacing units within the tract are drilled. Two potential well sites would be added under Alternatives 2 and 3, and 20 potential well sites would be removed under Alternative 3. Selection of Alternative 1, the No Action Alternative, would not affect CBM development on the tract. All of the potential drill sites under any of the other alternatives could be developed by the existing CBM lessees if the coal is not leased at this time.

As of September 1, 2000, forty-two applications to drill had been approved on the North Jacobs Ranch LBA Tract under the Proposed Action and Alternative 2. The BLM and state had approved drilling permits for 26 wells on federal leases, and the state had approved drilling permits for 16 wells on private leases. Twenty of these approved applications (ten private and ten federal) would be removed under Alternative 3.

As of September 1, 2000, seventeen wells were being or had been drilled on the tract as it is configured under the Proposed Action and Alternative 2 (seven federal and ten private). Only one of the wells that had been drilled as of September 1, 2000 would be included in the tract under Alternative 3.

The CBM lessee has reported potentially economic shows of CBM during well testing on these leases, but continuous CBM production and gas sales from wells on the tract has been waiting on completion of local and regional pipelines to transport the CBM.

Facilities associated with the oil and gas wells include production casing (which extends from the surface to the zone of production), production equipment (which may be located on the surface and/or underground), and underground pipelines which gather the oil and gas produced by the individual wells and carry it to larger transportation pipeline or collection facility. Facilities associated with the CBM wells at the present time are only the casings of the spudded wells. Numerous oil and gas pipelines cross the LBA Tract (Section 3.17 and Figure 3-12). As CBM wells are drilled and completed on the tract, additional facilities will be constructed to produce and transport the CBM and the associated produced water.

Coal mining is a dominant land use in the area surrounding the LBA Tract. The existing Jacobs Ranch Mine is within a group of five

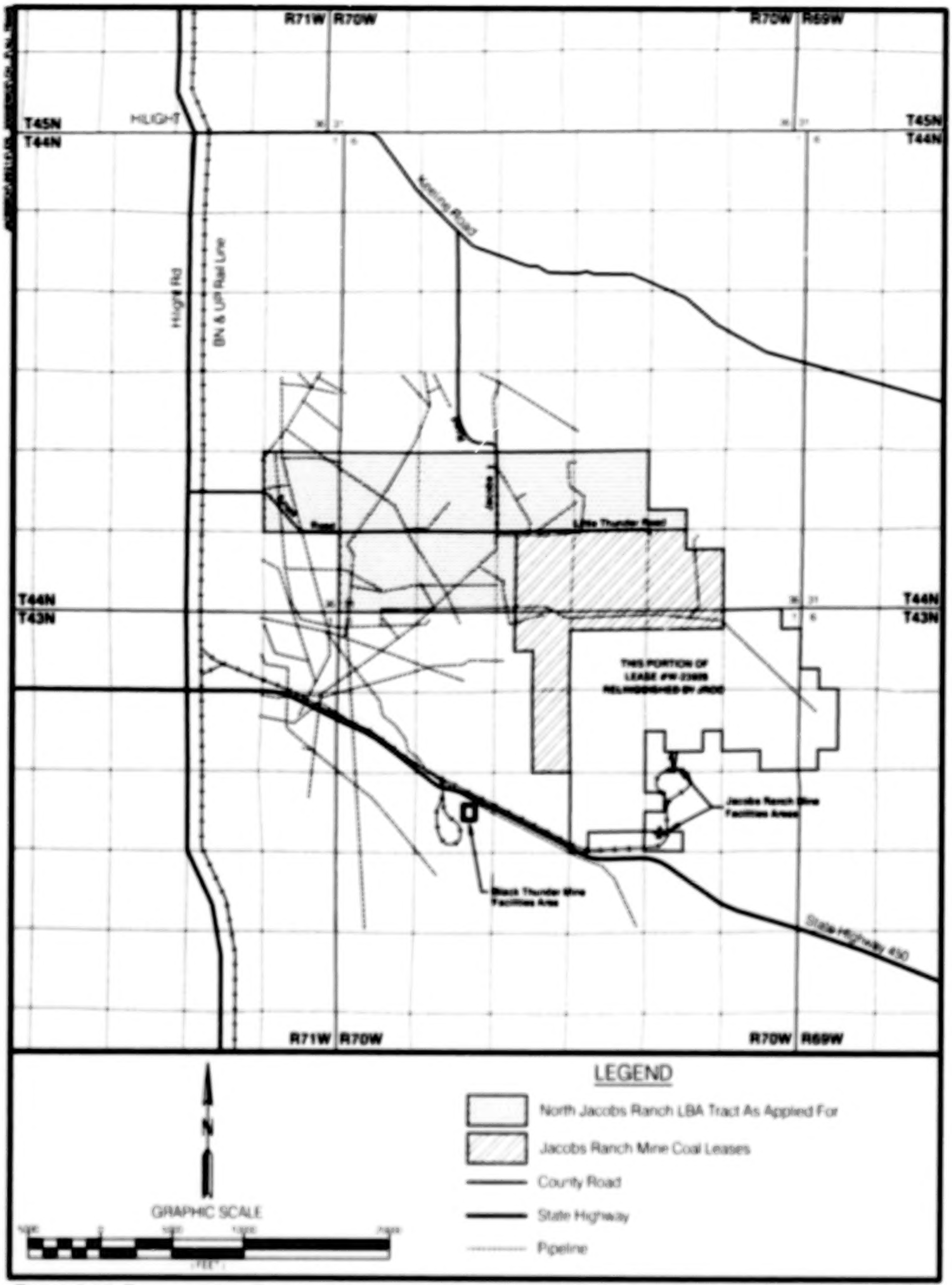


Figure 3-12 Transportation Facilities Within and Adjacent to the North Jacobs Ranch LBA Tract

operating surface coal mines located in southern Campbell and northern Converse counties (Figure 3-1). Coal production at these five mines increased by 154 percent between 1990 and 1999 (from about 70 million tons in 1990 to nearly 178 million tons in 1999). Since 1992, eight maintenance coal leases have been sold within this group and applications have been submitted for five more maintenance tracts in this same group, including the LBA being evaluated in this EIS (Tables 1-1 and 1-2). The North Jacobs Ranch LBA was previously applied for in 1996 by Evergreen Enterprises as part of the New Keeline LBA. The New Keeline LBA was rejected by the BLM in 1997. Evergreen Enterprises appealed the rejection of the New Keeline LBA to the Interior Board of Land Appeals in 1997 and submitted a new application, which covered the same area, in January, 2000 (State Section LBA). Evergreen Enterprises has withdrawn their appeal of the New Keeline rejection and their application for the State Section LBA as of September, 2000.

Campbell County has no applicable county-wide land use plans, and the LBA Tract has no designated zoning classification. The *City of Gillette/Campbell County Comprehensive Planning Program* (City of Gillette 1978) provides general land use goals and policies for state and federal coal leases in the county.

Big game hunting is the principal recreational use in the analysis area. Land ownership within the PRB is largely private (approximately 80 percent), with some private landowners permitting sportsmen to cross and/or hunt on their land. Others charge an access fee, and some do not allow any access. There has been a trend over the past two decades towards a substantial reduction in lands open and reasonably available for hunting. Access fees continue to rise and many resident hunters feel these access fees are unreasonable. This trend has created problems for the WGFD in their attempt to distribute and control harvest at optimal levels, as well as to sportsmen who desire access to these animals (WGFD 1996). Due to safety concerns, public lands contained within an active mining area are often closed to the public, further limiting recreational use. In the PRB, the publicly owned TBNG, BLM lands, and state school sections (normally Sections 16 and 36) are generally open to hunting if legal access is available. As shown in Figure 3-10, there are no public surface lands included in the North Jacobs Ranch LBA Tract.

The surface of all of the lands within the LBA Tract under the Proposed Action and the alternative configurations is currently privately owned and recreational use is allowed only with landowner permission. Sport hunting in varying degrees is conducted on the LBA Tract. Pronghorn, mule deer, and elk occur on and adjacent to the LBA Tract. Sage grouse, mourning dove, waterfowl, rabbit, and coyote may also be harvested in the vicinity, and some trapping of red fox may occur.

Specific details regarding big game herd management objectives in the project area are contained in the *Casper and Sheridan Region Annual Big Game Herd Unit Reports* (WGFD 1998).

The WGFD classifies the entire LBA Tract as yearlong habitat for antelope (habitat used by a portion of the animals yearlong and into which a significant influx of animal occurs during the winter), with none of the tract or areas within two miles adjacent classified as crucial or critical pronghorn habitat. Pronghorn are widely scattered throughout the Hilight Herd Unit. The North Jacobs Ranch LBA Tract is within pronghorn antelope Hunt Area 24, which contains the Hilight Herd Unit. The population was fairly stable and near the objective of 11,000 antelope prior to 1997. The herd then suffered significant losses during the severe winter of 1996-97 and blue-tongue losses in September 1998. Lower than average fawn survival for the past three years has also kept the population from increasing at a more normal rate. These factors have resulted in a drop in the population below the objective level. The 1998 postseason population model estimate for this herd is about 8,000 antelope (30 percent below the objective).

In 1995, the WGFD issued 2,000 licenses for the Hilight Herd, Hunt Area 24. In the years 1991 - 1995, hunters on average harvested about 1,150 animals, with better than 85 percent success, and spent about 1.9 days per animal harvested. Approximately 2,500 recreation days were spent on antelope hunting in 1995, compared to the WGFD objective of 3,500. The primary cause of the population being over objective, and the recreation days being under objective, is the lack of public access in the hunt area. According to the WGFD, the primary problems associated with the management of this herd include achieving an adequate harvest and hunter distribution. Hunt Area 24 contains mostly privately owned surface lands with poor access to the limited publicly owned surface lands. Those lands having access generally have lower antelope numbers.

In an effort to increase antelope numbers, the WGFD placed a limited quota on the number of licenses issued for Hunt Area 24 for the 1997-99 seasons. Antelope harvest in 1998 for Hunt Area 24 was only 171 animals, representing one of the lowest in over a decade as the below-objective population forced significant reductions in the license quotas for this herd unit to only 200 licenses. Hunter success was fairly high, but days per animal harvested was also quite high indicating that hunters had to work harder to bag an antelope. The harvest for the next few seasons is expected to remain about the same with continued conservative seasons for this herd.

The North Jacobs Ranch LBA Tract is located within the western portion of the WGFD Thunder Basin Mule Deer Herd Unit. The WGFD maps show the proposed lease area includes approximately 3,375 acres of yearlong mule deer range. Crucial or critical mule deer ranges do not occur on or within several miles of the LBA Tract. The LBA Tract is in mule deer Hunt Area 21, part of the Thunder Basin Herd Unit, which also includes Hunt Areas 7, 8, 9, 10, and 11. The Thunder Basin Herd Unit encompasses 3,642 square miles; of this 71 percent is privately owned. Access fees are common, resulting in heavy hunting pressure on accessible public land. Much of the public owned surface lands are scattered and inaccessible without crossing private land. In 1998, 1,421 mule deer were harvested from the Thunder Basin Herd Unit and the hunter success rate was 54 percent. The success rate declined from 79 percent in 1997 and was well below the five-year average of 63 percent. The days spent per animal harvested were 6.4 in 1998, above the five-year average of 4.9 days.

Since 1983 the postseason population objective for this herd has been 13,000. The population has consistently been above this objective. The 1998 postseason population was estimated at 17,298, which is 33 percent above the objective. To address this concern, the population objective was reviewed in 1998 and it was discovered that the model being used when the objective was set had some flaws. It appears that the deer population was likely closer to 25,000 when the population model was created. WGFD field personnel, hunters and landowners indicate that mule deer numbers in the Thunder Basin Herd Unit have declined from several years ago, yet indications are this population is greater than the objective of 13,000 head. The WGFD has therefore recommended that the objective be increased to 20,000 head. Landowners and the public have commented that they would like to see more deer in the area. The population model indicates the population is currently growing slowly.

The Rochelle Hills Elk Herd is located in southeastern Campbell County, southwestern Weston County, and north central Converse County. This herd has been steadily growing since its origination in the early 1950's, and WGFD management efforts have been directed at stabilizing herd growth around a population objective of 400 head. The 1998 postseason population was estimated to be 400. Elk Hunt Area 123 extends into the North Jacobs Ranch LBA Tract; however, very limited use of these lands by elk occurs. Elk favor the ponderosa pine/juniper woodlands, savanna, and steeper terrain habitat in the Rochelle Hills east of the LBA Tract. The WGFD designated roughly a five square mile area on Jacobs Ranch Mine reclaimed land as crucial winter habitat for the Rochelle Hills Elk Herd. Much of the occupied range of this herd is located on the Thunder Basin National Grassland, which is administered by the USFS. Hunting seasons within this herd have been permitted every 2 or 3 years, for a total of only six times in its history. Bull quality is very good for this herd, and many taken have scored in the record books. Owing to their habituation to humans, many people enjoy observing these elk along

Highway 450 and within accessible Forest Service land; thus they provide nonconsumptive recreational use opportunities. These elk are not causing significant damage to private lands and most area landowners as well as hunters generally desire a high quality herd. Elk have been observed dispersing from the designated herd boundary, possibly due to increasing population density and habitat limitations.

The WGFD big game herd unit maps show the LBA Tract is out of the normal white-tailed deer range, although they are occasionally seen in the vicinity.

Public fishing opportunities are extremely limited in the PRB. Only one fishery exists in the general analysis area: Little Thunder Creek supports channel catfish and a variety of nongame fish. No fisheries exist on the LBA Tract.

3.12 Cultural Resources

Cultural resources, which are protected under the National Historic Preservation Act of 1966, are the nonrenewable remains of past human activity. The PRB appears to have been inhabited by aboriginal hunting and gathering people for more than 11,000 years. Throughout the prehistoric past, the area was used by highly mobile hunters and gatherers who exploited a wide variety of resources.

The general chronology for aboriginal occupation (dated as years before present [B.P.]) is:

- the Paleoindian period (11,000-7,500 years B.P.),
- the Archaic period (7,500-1,800 years B.P.),
- the Prehistoric period (1,800-400 years B.P.),
- the Protohistoric period (400-200 years B.P.), and
- the Historic period (200-120 years B.P.).

The Paleoindian period includes a series of cultural complexes identified by distinctive large projectile points (spear points) often associated with the remains of large, now-extinct mammals (mammoth, bison, camel, etc.). The Archaic period is characterized by a range of smaller side-notched, stemmed, or corner-notched projectile points and by more generalized subsistence pursuits including the gathering of plant resources. This lifeway continued to the late Prehistoric period, which is marked by a technological change from dart projectiles to the bow and arrow and by the appearance of ceramics. During the Archaic and late Prehistoric periods, the PRB was occupied by small bands of hunters and gatherers whose movements were determined to a large degree by seasonal and environmental changes which influenced the occurrence of subsistence resources (BLM 1979).

Protohistoric and early Historic sites are found in the PRB, including rare historic trade goods, sites and routes associated with early trappers and military expeditions, and early ranching attempts which date to the 1880's. A few small coal mining sites also exist.

Historic sites within the analysis area have been recorded as debris scatters representing sheepherder camps and related activities. No historic trails are known or have been recorded on the LBA Tracts; however, the Bozeman Trail crosses the southwestern portion of the PRB.

A Class III cultural resources survey is a professionally conducted, intensive inventory of a target area, designed to locate all cultural properties which have surface and exposed profile indications. Cultural properties are recorded and sufficient information collected on them to allow evaluation for possible inclusion in the NRHP. That determination is made by the managing federal agency in consultation with SHPO. Consultation with SHPO must be completed prior to approval of the MLA mining plan.

Once a Class III survey is completed, site-specific testing or limited excavation is utilized, if necessary, to gather additional data which will: 1) determine the final evaluation status of a site and/or 2) form the basis of additional work that will be conducted during implementation of a treatment plan if the site is eligible for the NRHP. A treatment plan is then developed for those sites that are eligible for the NRHP and are within the area of potential effect. Treatment plans are implemented prior to mining and can include such mitigative measures as avoidance (if possible), large scale excavation, complete recording, Historic American Building Survey/Historic American Engineering Record documentation, archival research, and other acceptable scientific practices.

The North Jacobs Ranch LBA Tract and buffer zone was subjected to a Class III cultural resource inventory and assessment in 1999. The JRCC contracted with GCM Services, Inc. of Butte, Montana to conduct the survey. The project area covered approximately 7,315 acres of land proposed for coal lease and a buffer zone that would include all disturbance assuming the area is mined as a maintenance tract for the existing adjacent mine. The goal of the inventory was to locate and evaluate for the NRHP all cultural resources 50 years and older within the study area.

Previous cultural resource inventories have been conducted in the project area in association with oil field development. The surrounding area has also been inventoried in association with coal mine permitting. There are six previously recorded sites in the project area. Two were not relocated during this new inventory; both were recommended as not eligible for the NRHP. The four other previously recorded sites were relocated, and updated site records were prepared in the new inventory. The new inventory resulted in the location of 30 new sites. Therefore, the total number of cultural sites encountered during the project and reported is 34. Of this total, there are: 9 homesteads; 2 homesteads with modern ranch complexes; 1 multi-component site having both a homestead and a prehistoric lithic scatter; 1 multi-component site having both a prehistoric lithic scatter and a historic debris scatter; 1 historic graffiti site; 1 historic cairn site; 15 lithic scatters; 3 lithic scatters and campsites; and 1 lithic scatter and cairn. Twenty-six isolated finds were also recorded during the inventory. These include 22 prehistoric isolated artifacts and four historic isolated artifacts.

One prehistoric lithic scatter and campsite, 48CA341, is recommended as NRHP eligible under Criterion D. The cultural resource inventory report recommended that prior to any ground disturbing activities, a formal and extensive testing program should be undertaken at site 48CA341, and a mitigation contingency plan should be prepared and approved along with the testing plan. If the testing program reveals that no significant remains exist, the eligible status of the site would be changed to not eligible. All remaining sites have been recommended not eligible.

Table 3-9 summarizes the distribution of cultural sites by type.

Data recovery plans are required for those sites recommended eligible to the National Register following testing and consultation with the SHPO. Until full consultation has occurred, identifying the sites for mitigation or release, sites recommended eligible or of undetermined eligibility must be protected. Full consultation with SHPO will be completed prior to approval of the MLA mining plan.

3.13 Native American Consultation

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering sites, fasting or vision quest sites and selected rock art sites. Other sites of cultural interest and importance may include rock art sites, stone circles, and various rock features, fortifications or battle sites, burials, as well as locations which are sacred or part of the oral history and heritage that have no man-made features. No Native American heritage sites have been identified to date.

There are presently no documented Native American sacred sites in the general analysis area. However, the position of the area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devils Tower to the north) creates the possibility of existing locations which may have special religious or heritage significance to Native American groups.

Native American tribes were consulted at a general level in 1995-1996 as part of an effort to update the BLM Buffalo RMP. The Crow, Northern Cheyenne, Eastern Shoshone, Northern Arapaho, Oglala Lakota, Rosebud Sioux, Cheyenne River Sioux, Nez Perce, Shoshone-Bannock, Blackfeet, and Confederated Salish and Kootenai Tribes have been identified as potentially having concerns about actions in northern Wyoming. These

Table 3-9. Sites and Isolated Finds in the Class III Cultural Resource Inventory of the North Jacobs Ranch LBA Tract and Buffer Zone.

Prehistoric sites:	
Lithic scatter:	48CA339; 3544; 3547; 3548; 3549; 3551; 3552; 3553; 3554; 3555; 3556; 3557; 3562; 3567; 3570
Lithic scatter and campsite:	48CA341; 3543; 3545
Lithic scatter and cairn:	48CA3569
Isolated finds:	22 lithic items
Historic sites:	
Homestead:	48CA3542; 3546; 3550; 3558; 3560; 1666; 2988; 3568; 3571
Homestead with modern ranch:	48CA3559; 3566
Historic graffiti:	48CA3565
Historic cairn:	48CA3561
Isolated finds:	Abandoned Hay Wagon, Abandoned Chisel Plow, Buggy or Automobile Part, Modified Tin Can
Multicomponent sites:	48CA3563; 3564

tribal governments and representatives were sent copies of the draft EIS. They will also be provided with maps showing the location of the North Jacobs Ranch LBA Tract and more specific information about the known sites on this tract and their help will be requested in identifying potentially significant religious or cultural sites on the LBA Tract to support a leasing decision on the tract.

3.14 Paleontological Resources

The formations exposed on the surface of the PRB are the sedimentary Eocene Wasatch and Paleocene Fort Union formations, which are both known to contain fossil remains. Some paleontological surveys have been conducted in the PRB. Vertebrate fossils that have been described from the Wasatch Formation in the PRB include fish, turtle, champosaur, crocodile, alligator, and mammal specimens. The Fort Union also contains fossils of plants, reptiles, fish, amphibians, and mammals. No significant paleontological localities have been recorded on federal lands near the North Jacobs Ranch LBA Tract.

A paleontological survey has been conducted within and adjacent to the North Jacobs Ranch LBA Tract to determine the potential for recovery of significant fossils prior to disturbance. These lands include approximately 7,300 acres in T.44N., R.71W., Sections 23-26, 35 and 36; T.44N., R.70W., Sections 19-32 and 36.

No vertebrate or invertebrate fossils were discovered within the entire study area. The lack of good rock outcrops contributes to the lack of animal fossils, as does the low preservation potential and conditions of deposition of the Fort Union and Wasatch Formations. In contrast to the lack of fossil animal material, fossil plant material occurs frequently, although no localities produced exceptional examples. Most leaf impressions were found in fine sandstone and siltstone laminations, and woody debris generally occurs within channel sandstone.

3.15 Visual Resources

Visual sensitivity levels are determined by people's concern for what they see and the frequency of travel through an area. Landscapes within the general analysis area include rolling sagebrush and short-grass prairie, which are common throughout the PRB. Existing surface mines form a nearly continuous band on the east side of Highway 59 from Gillette south about 50 mi. Other man-made intrusions include ranching activities (fences, homesteads, livestock), oil and gas development (pumpjacks, pipeline ROW's), transportation facilities (roads and railroads) and electric power transmission lines. The natural scenic quality in the immediate lease area is fairly low because of the industrial nature of the adjacent existing mining operations.

The Jacobs Ranch Mine and Black Thunder Mine facilities and some mining activities are currently visible from the Keeline Road, the Hilight Road and State Highway 450. This would also be true for the LBA Tract.

For management purposes, BLM evaluated the visual resources on lands under its jurisdiction in the Buffalo and Platte River Resource Area RMPs. The inventoried lands were classified into VRM classes. These classifications range from I to V as follows:

> Class I - Natural ecologic changes and very limited management activity is allowed. Any contrast (activity) within this class must not attract attention.
>
> Class II - Changes in any of the basic elements (form, line, color, texture) caused by an activity should not be evident in the landscape.
>
> Class III - Contrasts to the basic elements caused by an activity are evident but should remain subordinate to the existing landscape.

Class IV - Activity attracts attention and is a dominant feature of the landscape in terms of scale.

Class V - This classification is applied to areas where the natural character of the landscape has been disturbed up to a point where rehabilitation is needed to bring it up to the level of one of the other four classifications.

The lands in the North Jacobs Ranch LBA area are generally classified as VRM Class IV. The existing mining activity is visible from most sites on the LBA Tract.

3.16 Noise

Existing noise sources in the area include adjacent coal mining activities, traffic on State Highway 450 and nearby county roads, rail traffic, and wind. Studies of background noise levels at adjacent mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Current noise levels in the North Jacobs Ranch LBA Tract are estimated to be 40-60 dBA, with the noise level increasing with proximity to active mining at the Jacobs Ranch Mine. Mining activities are characterized by noise levels of 85-95 dBA at 50 ft from actual mining operations and activities (BLM 1992b). Figure 3-13 presents noise levels associated with some commonly heard sounds.

3.17 Transportation Facilities

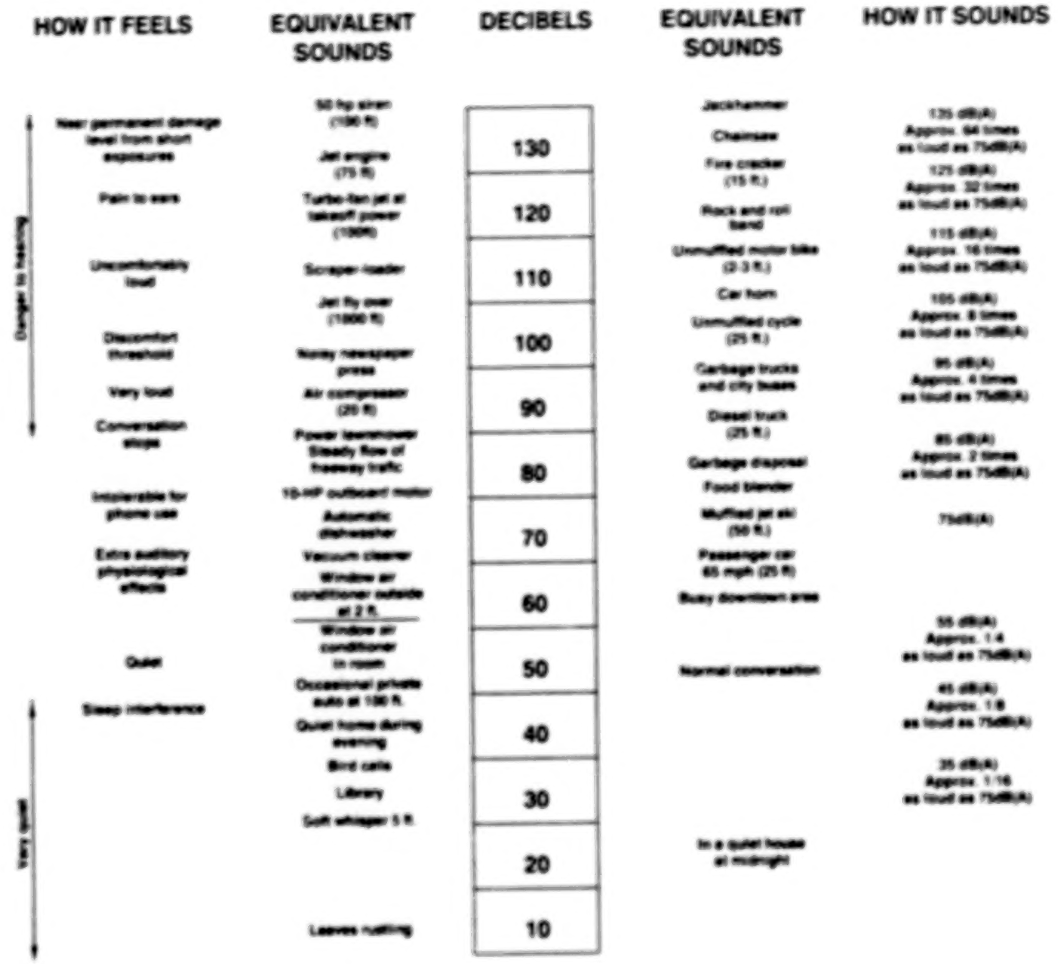
Transportation resources in the vicinity of the North Jacobs Ranch LBA Tract include State Highways 59 and 450; the Gillette-Douglas rail spur used jointly by the Burlington Northern-Santa Fe and Union Pacific Railroads; numerous pipelines; and local roads and accesses. Access to the LBA Tract is on Highway 450 via the paved Hilight Road or State Highway 59. Two-track roads also occur within the LBA Tract.

Current transportation facilities within and adjacent to the LBA Tract are depicted on Figure 3-12. Since the North Jacobs Ranch LBA Tract as applied for would be an extension of the existing Jacobs Ranch Mine operations, the existing coal transportation facilities and infrastructure would be used during mining of the North Jacobs Ranch Tract. As discussed in Section 3.11, additional pipelines will probably be built to transport CBM produced prior to mining.

3.18 Socioeconomics

The social and economic study area for the proposed project involves primarily Campbell County and the cities of Gillette and Wright; however, it also includes the city of Douglas in Converse County. The communities of Gillette and Douglas would most likely attract the majority of any new residents due to their current population levels and the availability of services and shopping amenities.

A comprehensive socioeconomic profile of the BLM Buffalo Resource Area (which includes all of Campbell County) was prepared for the BLM under contract with the Department


HOW IT FEELS
EQUIVALENT SOUNDS
DECIBELS
EQUIVALENT SOUNDS
HOW IT SOUNDS
Danger to hearing
Near permanent damage level from short exposures
Pain to ears
Uncomfortably loud
Discomfort threshold
Very loud
Conversation stops
Intolerable for phone use
Extra auditory physiological effects
Quiet
Sleep interference
Very quiet
50 hp siren (100 ft)
Jet engine (75 ft)
Turbo-fan jet at takeoff power (100ft)
Scraper-loader
Jet fly over (1000 ft)
Noisy newspaper press
Air compressor (20 ft)
Power lawnmower
Steady flow of freeway traffic
10-HP outboard motor
Automatic dishwasher
Vacuum cleaner
Window air conditioner outside at 2 ft.
Window air conditioner in room
Occasional private auto at 100 ft.
Quiet home during evening
Bird calls
Library
Soft whisper 5 ft.
Leaves rustling
130
120
110
100
90
80
70
60
50
40
30
20
10
Jackhammer
Chainsaw
Fire cracker (15 ft.)
Rock and roll band
Unmuffled motor bike (2-3 ft.)
Car horn
Unmuffled cycle (25 ft.)
Garbage trucks and city buses
Diesel truck (25 ft.)
Garbage disposal
Food blender
Muffled jet ski (50 ft.)
Passenger car 65 mph (25 ft)
Busy downtown area
Normal conversation
In a quiet house at midnight
135 dB(A) Approx. 64 times as loud as 75dB(A)
125 dB(A) Approx. 32 times as loud as 75dB(A)
115 dB(A) Approx. 16 times as loud as 75dB(A)
105 dB(A) Approx. 8 times as loud as 75dB(A)
95 dB(A) Approx. 4 times as loud as 75dB(A)
85 dB(A) Approx. 2 times as loud as 75dB(A)
75dB(A)
55 dB(A) Approx. 1/4 as loud as 75dB(A)
45 dB(A) Approx. 1/8 as loud as 75dB(A)
35 dB(A) Approx. 1/16 as loud as 75dB(A)

Adapted From ABC's of Our Noise Codes published by Citizens Against Noise, Honolulu, Hawaii

Figure 3-13. Relationship Between A-Scale Decibel Readings and Sounds of Daily Life

of Agricultural Economics, College of Agriculture, through the University of Wyoming's Cooperative Extension Service (University of Wyoming 1994). The portion of the following discussion that deals with Campbell County is derived from this report. Converse County socioeconomic data and additional Campbell County data were obtained from the Wyoming Department of Commerce, Wyoming Division of Economic Analysis, Wyoming Department of Employment, Wyoming Economic Development Office, and personal communications with local community development staff.

3.18.1 Population

According to 1990 census data, Campbell County had a population of 29,370, with Gillette accounting for 17,635 of the county's residents and Wright with 1,200. The 2000 population of Campbell County was estimated at 32,930 (U.S. Department of Employment, Research and Planning website October 2000). The 1998 population of Gillette was estimated at 21,817 (Campbell County Economic Development Corporation 2000). The 1996 population of Wright was estimated at 1,400.

Converse County's population in 1990 was listed as 11,128, with 5,076 of the county's residents residing in Douglas. The 1995 population of Converse County was 11,965 (U.S. Bureau of Census 1996). The 2000 population of Converse County was estimated at 12,470 (U.S. Department of Employment, Research and Planning website October 2000).

CBM-spurred population growth is occurring in both Gillette and Douglas; at this time exact census population counts are not available, but the current CBM boom is contributing to low housing vacancy and a tight labor market. To date, however, enrollments in Gillette-area schools have not increased as a result of CBM development due to a mobile, relatively young work force (Boyd Brown, Campbell County High School, personal communication October 16, 2000).

3.18.2 Local Economy

Coal production, as reported by the Wyoming State Inspector of Mines, showed the State's coal producers set a new yearly production record of 336.5 million tons in 1999. This was an increase of 6.5 percent over the 315.0 million tons produced in 1998. Campbell County coal production (13 active mines) increased by 7.4 percent (274.1 million tons to 294.3 million tons) from 1998 to 1999, while production in Converse County (2 mines, including Antelope) increased by 9.7 percent (23.4 million tons to 25.6 million tons). The combined 1999 production from the surface coal mines in these two counties was 95.1 percent of the total production in the State (Wyoming State Inspector of Mines 1999).

In 1997, 24 percent of the total employment and 28 percent of the total personal income in Campbell County were directly attributable to mining which also includes oil and gas employment. In Converse County for that year, 11 percent of the employment and 16 percent of the total personal income were directly attributed to mining (Wyoming Department of Employment 1999).

Approximate tax revenues from coal production in Campbell and Converse counties are presented in Table 3-10. Sales and use taxes are distributed to cities and towns within each county and to the county's general fund. Severance taxes are collected by the state for the removal or extraction of resources such as oil, natural gas, coal, and trona. The State of Wyoming retains approximately 83 percent of the severance tax, and the remainder is returned to the cities, towns, and counties. Ad valorem taxes, which include property taxes, are collected by the county and disbursed to schools, cities, towns, the state foundation, and various other subdivisions within the county. Mineral royalties are collected on the amount of production and the value of that production. The current royalty rate for federal coal leases is 12.5 percent, with half of this revenue returned to the state. Additional sources of revenue include lease bonus bids (also split with the state) and annual rentals that are paid to the federal government. The total fiscal benefit to the State of Wyoming from coal mining in the PRB was estimated at $1.10/ton of coal mined in a 1994 study conducted for BLM by the University of Wyoming (University of Wyoming 1994).

Nationally, the minerals industry is 1.3 percent of the GNP. In Wyoming, the minerals industry (including oil and gas) is 31 percent of the GSP, which makes it the largest sector of the Wyoming economy. Coal mining alone accounts for 9 percent of the Wyoming GSP (Wyoming Dept. of Administration and Information March 1999).

3.18.3 Employment

Coal mining has changed a great deal since the 1970's, and new technologies have been a major contributor to these changes. The local coal mining labor force grew during the 1970's, but declined during the 1980's. Since 1973, overall production has risen while employee numbers have decreased. This employment decline followed large industry capital investments in

Table 3-10. Estimated 2000 Fiscal Revenues from 1999 Coal Production in Campbell County and Converse County.

County	Sales and Use Collections[1, 3]	Severance Tax Collections[1]	Ad Valorem Tax Collections[1]	Royalty Collections[2]	Total Collections
Campbell	$22.2 million	$64.4 million	$57.2 million	$168.1 million	$311.9 million
Converse	$ 1.9 million	$ 5.6 million	$ 4.9 million	$ 14.6 million	$ 27.0 million

[1] Estimated tax receipts are based on most recent published records of Wyoming Department of Revenue.

[2] Royalties are based on 12 ½ percent of sales price on 1999 production, with sales price being the average for northeastern Wyoming (Wyoming Geo-Notes No. 67 September 2000).

[3] From all mining, which includes oil and gas.

facilities and production equipment, the majority of which was aimed at increasing productivity. Direct employment in the two counties' coal mining industry has remained relatively constant over the last few years at approximately 3,100 full-time employees.

As of January 2000, the total labor force in Campbell County stood at 19,804 with an unemployment rate of 4.5 percent, compared to 4.2 percent in December 1998 (Wyoming Department of Employment, Research and Planning 2000). At the beginning of 1999 around 2,808 people were directly employed in coal mining, representing about 15 percent of the employed labor force (Wyoming Department of Employment 1999).

Total employment in Campbell County peaked in 1985 at 21,668, the same year that mining employment (which in this case includes oil and gas workers) peaked at 6,312. Total employment declined to a low of 18,103 in 1988, and has generally increased since that time. The current CBM development has resulted in a tight local labor market for both skilled and unskilled labor, however the mining industry has no difficulty filling positions, even in a tight labor market. The mining industry is the employer of choice in Campbell County due to attractive wage and benefit packages and predictable schedules (Betsy Hockert, Wyoming Employment Center, Gillette, personal communication October 17, 2000).

As of January 2000, the total Converse County labor force was 6,582, with an unemployment rate of 6.3 percent, compared to 5.1 percent in December 1998. At the beginning of 1999 around 356 people, or five percent of the labor force, were directly employed by area coal mines (WCIC 1998). Total employment in Converse County declined from 7,643 in 1981 to a low of 5,988 in 1990, and has been increasing since that time. Mining employment in Converse County declined from 2,129 in 1981 to a low in 1991 of 723, and has been slowly increasing since that time.

3.18.4 Housing

In 1996, Gillette contained 7,775 housing units, and Wright contained 497 housing units, according to the Campbell County Economic Development Corporation (1997 Community Profile). According to the 1990 census, Campbell County contained 11,538 housing units, 7,078 of which were in Gillette. In early 2000, the average cost of a new 3-bedroom home in Gillette was $130,000; the average cost of an existing 3-bedroom home was $89,000. In Wright, the average 2000 prices of new and existing 3-bedroom homes were $88,000 and $72,000, respectively. Residential building permits in Campbell County rose from 15 in 1987 to 82 in 1992 to 100 in 1998 (the last year that data are available). Due to population growth associated with CBM development, the housing vacancy rate in Gillette is less than 1 percent (Judy Bayles,

Bayles Realty, personal communication, March 7, 2000).

In Converse County, residential building permits varied between zero and two per year from 1987 to 1992, rose to 27 in 1997 and fell to 12 in 1998. In March of 2000, Douglas contained approximately 2,400 housing units. Douglas is also experiencing a shortage of housing due to methane development with a vacancy rate approaching zero (Deirdre Hollaway, Horizon Realty, personal communication, March 7, 2000).

3.18.5 Local Government Facilities and Services

Gillette has generally maintained a steady population growth since 1987, when it totaled 17,054. Owing to the substantial revenues generated by mineral production, local government facilities and services have kept pace with growth and are adequate for the current population. The opening of the new South Campus of Campbell County High School has helped to alleviate overcrowding at the "North Campus." South Campus opened on February 1, 1999 with approximately 300 students and 22 teachers. Beginning with the 1999-2000 school year the numbers have increased to approximately 600 students and 33 teachers.

The 1996 population of Douglas (5,479) is lower than its peak of 7,800 in 1982, and local government facilities and services are generally adequate for the current population. The town also has limited building space (platted lots) available for future growth. Some indoor recreational facilities may also be near or at capacity.

Wright was established in 1976 by the Atlantic Richfield Company and is the nearest community to the southern group of PRB mines. Wright's population peaked in 1985 at approximately 1,800 and decreased to 1,285 by 1994. The 1996 population of Wright was 1,400. Currently, (Fall of 2000) the town of Wright is not experiencing population growth due to CBM development (Tammie Buresh, Wright Water and Sewer District, personal communication October 17, 2000). Wright's infrastructure is more than adequate for the current and planned population, and with the current building going on it can double in population before services become limiting.

3.18.6 Social Conditions

Despite past boom and bust cycles in the area's economy, a relatively stable social setting now exists in these communities. Most residents have lived in the area for a number of years, social ties are well established, and residents take great pride in their communities. Many of the people place a high priority on maintaining informal lifestyles and small town traditions, and there are some concerns that the area could be adversely affected by more than a modest growth in population. At the same time, there is substantial interest in enhancing the economic opportunities available in the area and a desire to accommodate reasonable levels of growth and development.

Wyoming's economy reached the bottom of an energy bust in 1987 and started to recover (Wyoming Department of Administration and Information, March 1999). That recovery began to slow in 1996. The forecast is for slow growth through 2008; Wyoming's population is projected to increase at 0.5 percent per year. Non-agricultural employment is projected to increase by 22 percent by 2008, increasing 1.4 percent in 2000 and then slowing to 1.1 percent per year by 2006. Mining employment is projected to decline by 8.2 percent by 2008. In 1998 there were 17,000 jobs in the mining sector. This dropped to 15,600 in 1999, with 1,000 jobs lost in oil and gas extraction, 300 in non-metallic minerals and 100 in coal mining (Wyoming Department of Administration and Information, February 2000).

3.18.7 Environmental Justice

Environmental Justice issues are concerned with actions that unequally impact a given segment of society either as a result of physical location, perception, design, noise, etc. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations" was published in the *Federal Register* (59 FR 7629). The Executive Order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations (defined as those living below the poverty level). The Executive Order makes it clear that its provisions apply fully to Native American populations and Native American tribes, specifically to effects on tribal lands, treaty rights, trust responsibilities, and the health and environment of Native American communities.

Communities within Campbell and Converse counties, entities with interests in the area, and individuals with ties to the area all may have concerns about the presence of a coal mine within the general analysis area. Communities potentially impacted by the presence or absence of a coal mine have been identified in this section of the EIS. Environmental Justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of Environmental Justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning Environmental Justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with the consultation and coordination described in Section 1.5 of this document. This EIS and contributing socioeconomic analysis provide a consideration of impacts with regard to disproportionately adverse impacts on minority and/or low-income groups, including Native Americans.

3.19 Hazardous and Solid Waste

Potential sources of hazardous or solid waste on the North Jacobs Ranch LBA Tract would include spilling, leaking, or dumping of hazardous substances, petroleum products, and/or solid waste associated with mineral, coal, oil and/or gas exploration and development or agricultural or livestock activities. No such hazardous or solid wastes are known to be present on the LBA Tract. Wastes produced by current mining activities at the Jacobs Ranch Mine are handled according to the procedures described in Chapter 2.

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter discloses the potential environmental consequences that may result from implementing the Proposed Action, Alternative 1 (the No-Action Alternative), Alternative 2, and Alternative 3. The effect or impact a consequence will have on the quality of the human environment is also discussed. For instance, the consequence of an action may be to greatly increase the number of roads in an area. If the number of roads in an area is increased, opportunities for road-based recreation would be increased but opportunities for primitive recreational activities and solitude would be decreased. Evaluation of the impact would depend on an individual's (or a group's) preferred use of that area.

If the North Jacobs Ranch LBA[1] Tract is leased to the applicant as a maintenance tract under one of the action alternatives, the permit area for the adjacent mine would have to be amended to include the new lease area before it could be disturbed. Table 4-1 shows the area to be mined and disturbance area for the existing Jacobs Ranch Mine (which represents the No-Action Alternative), and how the mine area would change under the Proposed Action, Alternative 2, and Alternative 3. If the tract is leased, the area that would have to be added to the existing permit area would be the LBA Tract plus an adjacent strip of land that would be used for highwall reduction after mining and such mine-related activities as construction of diversions, flood- and sediment-control structures, roads, and stockpiles. Portions of the LBA Tract that are contiguous to the existing leases will be disturbed under the current mining plans in order to recover the coal in the existing leases. The environmental consequences of implementing either the Proposed Action, Alternative 2, or Alternative 3 would be similar in nature, but in general Alternative 3 would have less impact because it would disturb a smaller area than the Proposed Action or Alternative 2.

Surface mining and reclamation have been ongoing in the PRB for over two decades. During this time, effective mining and reclamation technologies have been developed and continue to be refined. Mining and reclamation operations are regulated under SMCRA and Wyoming statutes. WDEQ technically reviews all mine permit application packages to ensure that the mining and reclamation plans comply with all state permitting requirements and that the proposed coal mining operations comply with the performance standards of the DOI-approved Wyoming program. BLM attaches special stipulations to all coal leases (Appendix D), and there are a number of federal and state permit approvals that are required in order to conduct surface mining operations (Appendix A). The regulations are designed to ensure that surface coal mining impacts are

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[1] Refer to page vii for a list of abbreviations and acronyms used in this document.

Table 4-1. Comparison of Existing and Proposed Jacobs Ranch Mine Disturbance Area and Mining Operations.

	No Action Alternative (Existing Permit Area)	**Proposed Action**	**Alternative 2**	**Alternative 3**
Additional Lease Area (Acres)	—	4,821.2	4,982.2	3,363.6
Total Lease Area (Acres)	6,955	11,776.2	11,937.2	10,318.6
Increase in Lease Area	---	69.3%	71.6%	48.4%
Estimated Total Disturbance Area (Acres)[1]	8,122	13,486	13,587	11,811
Increase in Estimated Disturbance Area	---	66%	67%	45%
Estimated Recoverable Coal Remaining as of 1/00[2] (Million Tons)	203.3	670.4	674.3	486.6
Increase in Estimated Recoverable Coal as of 1/00	---	230%	232%	140%

Notes:

[1] Total Disturbance Area = area to be mined + area disturbed for mine facilities, access roads, haul roads, railroad facilities, stockpiles, etc.

[2] Estimated Recoverable Coal Resources = tons of mineable coal x recovery factor. For the North Jacobs Ranch LBA Tract, mineable coal = 519 millions tons (Proposed Action), 523 million tons (Alternative 2) or 317 million tons (Alternative 3) and JRCC's estimated recovery factor = 90 percent, based on historic operations.

mitigated. The impact assessment that follows considers all measures required by federal and state regulatory authorities as part of the Proposed Action and Alternatives. Section 4.1 analyzes the direct and indirect impacts associated with leasing and mining the LBA Tract under the Proposed Action, Alternative 2, and Alternative 3. Section 4.2 presents the probable environmental consequences of the No-Action Alternative (Alternative 1, not issuing a lease for the tract). Section 4.3 discusses regulatory compliance, mitigation, and monitoring in terms of what is required by federal and/or state law (and is therefore part of the Proposed Action and alternatives) and any additional mitigation and monitoring that may be required. Section 4.4 summarizes the residual effects of the Proposed Action, Alternative 2, and Alternative 3. Section 4.5 discusses the cumulative impacts that would occur if these lands were mined when added to other past, present, and reasonably foreseeable future actions. The cumulative impact analysis includes a discussion of other projects that are in progress, or are proposed in the area of the LBA Tract and that would occur independently of leasing the LBA Tracts. These projects include: 1) construction and operation of the Two Elk power plant, which has been proposed east of the

Black Thunder Mine; 2) construction of Wygen #1 power plant which has been proposed at the Wyodak Mine site; 3) the construction of the proposed DM&E Railroad line; and 4) the ongoing development of CBM resources west of the area of active coal mining. Section 4.6 analyzes the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity. Section 4.7 presents the irreversible and irretrievable commitments of resources that would occur with implementation of the Proposed Action, Alternative 2, or Alternative 3.

4.1 Direct and Indirect Impacts of Action Alternatives

Impacts can range from beneficial to adverse, and they can be a primary result of an action (direct) or a secondary result (indirect). They can be permanent, long-term (persisting beyond the end of mine life and reclamation), or short-term (persisting during mining and reclamation and through the time the reclamation bond is released). Impacts also vary in terms of significance. The basis for conclusions regarding significance are the criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgement of the specialists doing the analyses. Impact significance may range from negligible to substantial; impacts can be significant during mining but be reduced to insignificance following completion of reclamation.

4.1.1 Topography and Physiography

Surface coal mining would permanently alter the topography of the LBA Tract. Topsoil would be removed from the land and stockpiled or placed directly on recontoured areas. Overburden would be blasted and stockpiled or directly placed into the already mined pit, and coal would be removed. The existing topography on the LBA Tract would be substantially changed during mining. A highwall with a vertical height equal to overburden plus coal thickness would exist in the active pits. If necessary, Mills and Shipley Draws would be diverted into temporary channels or blocked to prevent flooding of the pits. A direct, permanent impact would be topographic moderation. The restored land surface would contain gentler, more uniform slopes, but the basic drainage network would be restored. Because the tract is located along a drainage divide, affected drainages are small and topography is already relatively flat. Following reclamation, the average surface elevation would be approximately 36 ft lower due to removal of the coal. (The removal of the coal would be partially offset by the swelling that occurs when the overburden and interburden are blasted and removed.) The land surface would be restored to the approximate original contour or to a configuration approved by WDEQ/LQD during the permit revision process.

Direct adverse impacts resulting from topographic moderation would include a reduction in microhabitats (e.g., cutbank slopes) for some wildlife species and a reduction in habitat diversity, particularly a reduction in slope-dependent shrub communities and associated habitat. A potential indirect impact may be a long-term reduction in big game carrying capacity. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and result in a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur as a result of higher near-surface bulk density of the reclaimed soils (Section 4.1.3). It may also increase vegetative productivity, and potentially accelerate recharge of groundwater. The approximate original drainage pattern would be restored, and stock ponds and playas would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would adequately support anticipated land use.

These impacts are occurring on the existing Jacobs Ranch Mine coal leases as coal is mined and mined-out areas are reclaimed. Under the Proposed Action, Alternative 2, or Alternative 3, the area that would be permanently topographically changed would increase as shown in Table 4-1.

4.1.2 Geology and Minerals

Within the North Jacobs Ranch LBA Tract, mining would remove an average of 214.2 ft of overburden, 2.8 ft of interburden, and 64 ft of coal on about 4,798 acres under the Proposed Action. The coal reserves beneath an area of approximately 24 acres within the Proposed Action lease area (4,821.2 acres) have been burned. Mining would remove an average of 211.6 ft of overburden, 2.8 ft of interburden, and 63.5 ft of coal on about 4,873 acres under the Alternative 2 tract configuration. The coal reserves beneath an area of approximately 109.4 acres within the Alternative 2 lease area (4,982.2 acres) have been burned. Under Alternative 3, mining would remove an average of 203.3 ft of overburden, 3.1 ft of interburden, and 57.5 ft of coal on about 3,254 acres. The coal reserves beneath an area of approximately 109.4 acres within the Alternative 3 lease area (3,363.6 acres) have been burned. These acreage figures represent the estimated area of actual coal removal under the Proposed Action and Alternatives 2 and 3. Table 4-2 compares the estimated coal, overburden, and interburden thicknesses for the existing Jacobs Ranch Mine permit area with estimated coal, overburden and interburden thickness for the North Jacobs Ranch LBA Tract as applied for, and Alternatives 2 and 3.

The replaced overburden and interburden would be a relatively homogeneous (compared to the premining layered overburden and interburden) and partly recompacted mixture averaging about 240 ft in thickness under the Proposed Action and Alternatives 2 and 3. Approximately 467 million additional

Table 4-2. Comparison of Existing and Proposed Jacobs Ranch Mine Coal, Overburden, and Interburden Thicknesses.

	No Action Alternative (Existing Permit Area)	**Proposed Action as Applied for LBA Tract**	**Alternative 2 Tract**	**Alternative 3 Tract**
Average Overburden Thickness (feet)	133.2	214.2	214.0	203.3
Average Total Mineable Coal Thickness (feet)	57.1	64.0	64.0	57.5
Average Interburden Thickness (feet)	6.9	2.8	2.8	3.1

tons of coal would be mined under the Proposed Action, compared to 471 million tons under Alternative 2, or 285 million tons under Alternative 3.

The geology from the base of the coal to the land surface would be subject to permanent change on the LBA Tract under the Proposed Action or the action alternatives. The subsurface characteristics of these lands would be radically changed by mining. The replaced overburden and interburden (spoil) would be a mixture of the geologically distinct layers of sandstone, siltstone, and shales that currently exist. The resulting physical characteristics would also be significantly altered.

Drilling and sampling programs are conducted by all mine operators to identify overburden material that may be unsuitable for reclamation (i.e., material that is not suitable for use in re-establishing vegetation or that may affect groundwater quality due to high concentrations of certain constituents such as selenium or adverse pH levels). As part of the mine permitting process, each mine operator develops a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. Each mine operator also develops backfill monitoring plans as part of the mine permitting process to evaluate the quality of the replaced overburden. These plans are in place for the existing Jacobs Ranch Mine and would be developed for the North Jacobs Ranch LBA Tract if it is leased.

During mining, other minerals present on the tract could not be developed however, some of these minerals could be developed after mining. Conventional oil and gas wells would have to be plugged during mining, but could be recompleted after mining if the remaining reserves economically justify the expense of the recompletion. As discussed in Sections 3.3 and 3.11, the North Jacobs Ranch LBA tract overlies part of the Hilight Oil and Gas Field, which was discovered in 1969. There are 29 conventional wells located on the tract under the Proposed Action and Alternative 2, 17 under Alternative 3. Prior to mining, the active wells in this field (21 under the Proposed Action and Alternative 2, 14 under Alternative 3) would have to be abandoned and the production equipment for all of the wells on the tract would have to be removed to a level below the coal. The oil and gas reservoir which these wells produce from will not be disturbed by removal of the coal. The oil and gas lessee could recomplete or redrill wells to recover remaining oil and/or gas resources from any subcoal oil and gas reservoirs following mining, if they believe that the value of the remaining reserves would justify the expense of re-establishing production.

CBM resources that are not recovered prior to mining would be irretrievably lost when the coal is removed. As discussed in Sections 3.3 and 3.11, CBM wells are being drilled on the North Jacobs Ranch LBA tract. As many as 60 CBM wells locations are present on the LBA tract, and 42 applications to drill had been approved as of September 1, 2000. These wells can produce CBM during the time it takes to lease and permit the LBA tract and, on a case by case basis, until mining activity approaches them. Any CBM reserves that remain at that time will be lost when the coal is mined. This arrangement, which allows for optimizing recovery of both resources, is dependent on cooperation between the oil and gas lessees and the coal lessees. If the lessees can not reach agreement on how to coordinate recovery of both resources and how to determine the value of the resources that are not recovered, then the CBM resources would be lost during mining or the mining would have to be postponed. If the mining is postponed too long, the coal may not be recovered.

4.1.3 Soils

Under the currently approved mining and reclamation plan, approximately 8,122 acres of soil resources will be disturbed in order to mine the coal in the existing leases at the Jacobs Ranch Mine (Table 4-1). Disturbance related to coal mining would directly affect an additional 5,364 acres of soil resources on and adjacent to the LBA Tract under the Proposed Action, 5,465 acres under Alternative 2, or 3,689 acres under Alternative 3. The reclaimed soils would have different physical, biological, and chemical properties than the premining soils. They would be more uniform in type, thickness, and texture. Average topsoil thickness would be 24 to 36 inches across the entire reclaimed surface. Soil chemistry and soil nutrient distribution would be more uniform, and average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on the reclaimed land. The replaced topsoil would support a stable and productive vegetation community adequate in quality and quantity to support the planned postmining land uses (wildlife habitat and rangeland).

Specific impacts to soil resources would include an increase in the near-surface bulk density of the reclaimed soil resources. As a result, the average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation would potentially decrease runoff, which would tend to offset this potential increase in runoff due to decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering action would form new soil structure in the reclaimed soils, and infiltration rates would gradually return to premining levels.

Direct biological impacts to soil resources would include a short-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts for soil resources that are stockpiled before placement.

Sediment control structures would be built to trap eroded soil, revegetation would reduce wind erosion, and soil or overburden materials containing potentially harmful chemical constituents (such as selenium) would be specially handled. These measures are required by state regulations and are therefore considered part of the Proposed Action and action alternatives.

4.1.4 Air Quality

WDEQ/AQD issued an air quality permit (MD-425) for the Jacobs Ranch Mine on September 13, 1999. JRCC's current air quality permit allows up to 38 mmtpy to be mined through year 2001, and 50 mmtpy to be mined in 2002 through 2004. The actual production rate depends on market conditions and contracts. In 1999, JRCC's production was 29.1 million tons. As shown on Table 2-1 of Chapter 2, anticipated annual production on the Jacobs Ranch Mine, including the North Jacobs Ranch LBA Tract, is 39 million tons. Subject to market constraints, JRCC plans to achieve its maximum permitted coal production rate by year 2002. Plans and permits to increase coal production to 50 mmtpy are in place, but if JRCC does not acquire the North Jacobs Ranch Tract, they may not invest in the additional personnel and equipment. As discussed in Chapter 2, coal production without the North Jacobs Ranch LBA Tract is expected to remain at 30 mmtpy.

Figure 4-1 was prepared using the air quality modeling analysis that was included in a Section 21 Permit Application to modify the Jacobs Ranch Mine Air Quality Permit MD-224 (JRCC 1999c). This air quality permit modification application was submitted to the WDEQ/AQD in 1999 as a request to allow Jacobs Ranch Mine's coal production be increased from 35 mmtpy to 50 mmtpy. The application provided demonstrations that the operation at this increased production rate would allow the Jacobs Ranch Mine to remain in compliance with applicable state and federal air quality regulations. Figure 4-1 illustrates the maximum modeled

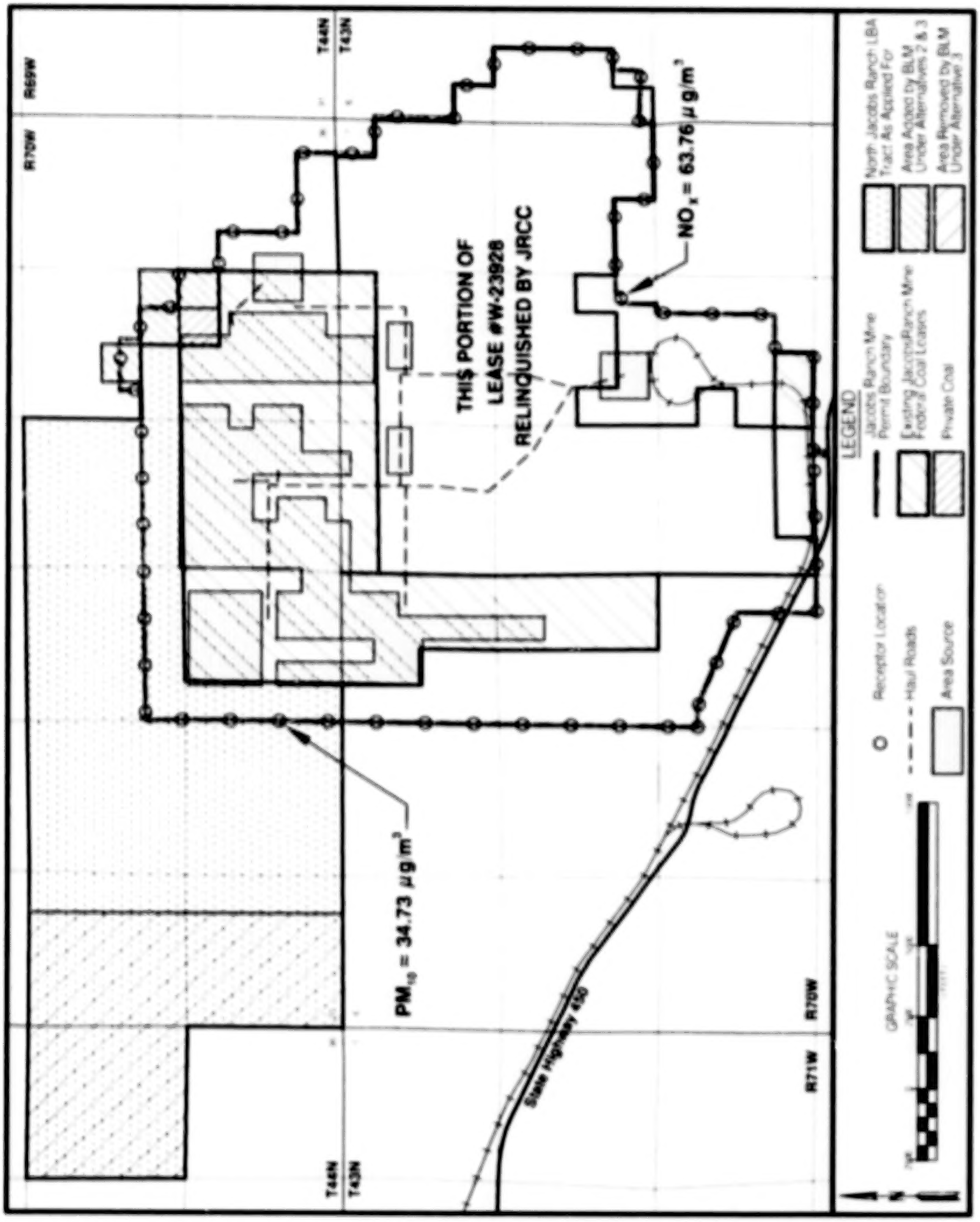

R70W
R69W
T44N
T43N
R71W
R70W
THIS PORTION OF LEASE #W-23928 RELINQUISHED BY JRCC
PM$_{10}$ = 34.73 µg/m^3
NO$_x$ = 63.76 µg/m^3
State Highway 450
LEGEND
Receptor Location
Haul Roads
Area Source
Jacobs Ranch Mine Permit Boundary
Existing Jacobs Ranch Mine Federal Coal Leases
Private Coal
North Jacobs Ranch LBA Tract As Applied For
Area Added by BLM Under Alternatives 2 & 3
Area Removed by BLM Under Alternative 3
GRAPHIC SCALE

Figure 4-1. Modeled Maximum PM$_{10}$ and NO$_x$ Concentrations at Jacobs Ranch Mine Permit Boundary, Year 2003 Worst-Case Scenario Resulting from 50 Million Tons Per Year of Coal Removal from Existing Leases.

annual average PM_{10} and NO_X concentrations in 2003, which is the predicted worst-case scenario year based on maximum particulate emissions from the Jacobs Ranch Mine.

Figure 4-1 indicates that at a coal removal rate of 50 mmtpy, the highest predicted annual mean PM_{10} concentration is 34.73 μg/m^3 (including 15 μg/m^3 background concentration) at the model receptor location shown. The predicted PM_{10} concentrations at all other model receptor locations are less than 34.73 μg/m^3. Concentrations above 50 μg/m^3 are predicted in the active pit areas, although the state standard requires only that annual average particulate concentrations above 50 μg/m^3 not be exceeded at the mine's permit boundary.

According to the air quality permit modification application, increase in coal production at the Jacobs Ranch Mine to 50 mmtpy did not require any new controls or changes in the coal preparation plant sources over and above those already permitted for 35 mmtpy. The application presented an emissions inventory for all sources within the Jacobs Ranch Mine, from neighboring sources (Black Thunder Mine, North Rochelle Mine) and proposed neighboring sources (Two Elk power plant and Encoal power plant) for each year of mine life. These sources were input to the dispersion modeling analysis to determine potential air quality impacts in the vicinity.

Since February 2, 1996, AQD has required mines to model for NO_X. The NO_X inventory in the model must include mine-related vehicular tailpipe emissions, emissions from blasting, and emissions from locomotive engines while these engines are on the mine property. In JRCC's 1999 Section 21 Permit Application, modeling predicted the 2003 annual average NO_X concentration of 63.76 μg/m^3 (background concentration = zero) at the model receptor location shown in Figure 4-1, and the predicted NO_X concentrations at all other model receptor locations are less. Therefore, the maximum modeled annual average NO_X concentrations at all receptor locations are well below the Wyoming Annual Ambient Air Quality Standard of 100 μg/m^3.

Modeling and permit approval is done with the understanding that BACT will be applied. For the Jacobs Ranch Mine, BACT includes watering and/or chemical stabilization on haul roads and access roads; watering topsoil removal and laydown areas; minimizing overshoot and stemming in blasting areas; minimizing fall distance in overburden and coal removal areas; prompt and contemporaneous reclamation; stilling sheds for coal truck dumps; and covered conveyors, silos, water sprays, baghouses and other dust control systems for coal handling and storage.

Blasting is not a major source of particulate emissions at PRB mines (PM_{10} emissions inventories show that overburden and coal blasting comprise less than one percent of the total emissions). Overburden removal, wind erosion, and coal haul roads generate the majority of dust.

A surface coal mine is not a named facility under Wyoming's PSD regulations and therefore is not considered a "major emitting facility" unless it has the potential to emit 250 tons or more per year of any regulated pollutant. Fugitive dust emissions are not considered in determining potential to emit. Because the maximum annual mass emission rate of PM_{10} or NO_X from all point sources at the Jacobs Ranch Mine will be less than 250 tons per year (NO_X is negligible, and PM_{10} from truck dumps plus coal preparation facility sources is 82.3 tons per year), the mine was not subject to an increment analyses under PSD regulations. The maximum annual average PM_{10} concentrations need only be compared to the Wyoming annual average ambient air quality standard of 50 $\mu g/m^3$.

Jacobs Ranch Mine's air quality permit (MD-425) is based on the results of computer modeling that predicted no violation of air quality standards and demonstrated that emissions would have no significant cumulative effect when added to emissions from neighboring sources. If JRCC acquires the North Jacobs Ranch LBA Tract, they would be required to modify their WDEQ/AQD air quality permit to include the LBA Tract before it could be mined. Provided the maximum production rate remains at 50 mmtpy and emissions from all considered sources do not increase, modeling may or may not be required for the revision. Fugitive dust and gaseous pollutant emissions would be expected to remain within levels allowed by the current permit. If JRCC acquires the LBA Tract, they would mine it and their existing leases using basically the same equipment with similar BACT emission control. The PM_{10} concentrations predicted along the edges of the existing Jacobs Ranch Mine permit area would be shifted to the edges of the amended permit area, and mining at the Jacobs Ranch Mine would be extended by roughly 8 to 13 years, depending on the alternative selected. As a result, there would not be an increase in direct and indirect impacts to air quality, but there would be a continuation of the existing permitted impact.

As discussed in Section 3.5, there is growing public concern over the releases of NO_x from overburden blasting, which can form a low-lying, gaseous orange cloud that can be transported by wind. At the WMA sponsored Gillette symposium held to discuss this issue on January 12 and 13, 2000 experts from industry and government agencies discussed the issue and possible causes and solutions. Some of the possible solutions being explored are improved blasting techniques or explosives and reduced powder factors. A more detailed analysis of the gases that form the clouds is also planned, which may increase understanding of the causes of the problem and suggest possible solutions. Currently, JRCC is a participant in an industry work group formed to study the impacts of NO$_x$. In the summer of 1999, baseline background air quality data were collected at six sites in the PRB using handheld monitors. The group is now developing a testing program to collect information on the contents of post-blast gas clouds. To date, sampling results are not available.

Air quality impacts resulting from, or associated with, mining operations would be limited primarily to the operational life of the mine. During the time the LBA Tract is mined, the elevated levels of particulate matter in the vicinity of the mining operations would continue, as would the elevated concentrations of gaseous emissions due to fuel combustion. Compliance with all state and federal air quality standards would be maintained. As with current operations, mining would occur near State Highway 450, the Hilight Road and the Keeline Road making dust visible to the public. The required mitigation measures, which are discussed in Section 4.3, would minimize this impact.

Air quality impacts from the No Action Alternative, the Proposed Action, Alternative 2, and Alternative 3 would not be expected to be substantially different. Under the No Action Alternative, coal production is projected to be 30 mmtpy, and under the Proposed Action, Alternative 2, and Alternative 3, production is projected to be 39 mmtpy, which is a 30 percent production increase. Modeling indicates production could increase to 50 mmtpy without exceeding compliance levels for air pollutants. PM$_{10}$ and TSP data collected from 1995 through 1999 at air quality monitoring stations located upwind and downwind of the Jacobs Ranch Mine are shown in Figure 3-5 and discussed in Section 3.5. These data indicate that TSP levels at both the upwind and downwind monitoring stations remained relatively constant while coal and overburden production also remained relatively constant from 1995 through 1998. The mine's overburden production increased from 57.8 million cubic yards in 1998 to 82.3 million cubic yards in 1999 and the TSP at both the upwind and downwind monitoring sites also increased. However, as the rate of overburden production increased there was not a proportionate increase in TSP measured at the downwind mine boundary relative to the upwind mine boundary as might be expected. In fact, the annual average TSP concentration was greater at the upwind site than the downwind site. Distances from the air quality monitoring stations (Figure 3-4) to the active pits may be a factor in this apparent discrepancy. The mining operation has progressed into the northern extent of the permit area and is consequently nearer to the upwind monitoring station than the downwind monitoring station. Therefore, the TSP levels along the upwind side of the mine would be expected to remain as high as the levels along the downwind side of the mine for as long as the active pits are within the north and west (upwind) side of the permit area. The average annual TSP levels at both the upwind and downwind sites did not exceed the former air quality standard from

1995 through 1999, nor was the current PM_{10} standard exceeded during that time.

Based on the Jacobs Ranch Mine's air quality monitoring information, the average annual PM_{10} levels are expected to remain within the current air quality standards with the increased coal production projected to occur under the Proposed Action, Alternative 2, and Alternative 3. Haul distances from the pit to the crushing facilities would be increased, so dust emissions may increase in proportion to the increased haul distance.

The nearest Class I area is located approximately 80 miles east at Wind Cave National Park in southwestern South Dakota. Mines are not considered to be major emitting facilities in accordance with Section 24 of WDEQ/AQD Rules and Regulations. Therefore, mines are not required by the State of Wyoming to evaluate their impacts on that Class I area. However, BLM evaluates such issues for leasing. For this EIS regional air quality impacts are evaluated under cumulative impacts (Section 4.5).

4.1.5 Water Resources

Surface Water

Changes in runoff characteristics and sediment discharges would occur during mining of the LBA Tract as a result of the destruction and reconstruction of drainage channels as mining progresses. Erosion rates could reach high values on the disturbed area because of vegetation removal. However, both state and federal regulations require that all surface runoff from mined lands be treated as necessary to meet effluent standards. Generally, the surface runoff sediment is deposited in ponds or other sediment-control devices inside the permit area.

Due to its location in the headwater area of Mills and Shipley Draws, along with numerous closed basins, runoff within the LBA Tract is not expected to be significant. During mining, hydrologic control will most likely consist of allowing runoff to accrue to the mine pit, where it will be treated and discharged according to the standards of WDEQ/WQD. Large flood control reservoirs or drainage diversions are not anticipated for the LBA Tract.

Sediment produced by large storms (i.e., greater than the 10-year, 24-hour storm) could adversely impact downstream areas. Since the tract would be mined as an extension of the existing Jacobs Ranch Mine under the action alternatives, there would not be a large increase in the amount of area disturbed and not reclaimed at any given time. WDEQ/LQD would also require a monitoring program to assure that ponds would always have adequate space reserved for sediment accumulation.

The loss of soil structure would act to increase runoff rates on the LBA Tract in reclaimed areas. The general decrease in average slope in reclaimed areas, discussed in Section 4.1.1, would tend to counteract the potential for an increase in runoff. Soil structure would gradually reform over time, and vegetation (after successful reclamation) would provide erosion protection from raindrop impact, retard surface flows and control runoff at approximately premining levels.

After mining and reclamation are complete, surface water flow, quality, and sediment discharge from the LBA Tract would approximate premining conditions. The impacts described above would be similar for both the Proposed Action and Alternatives 2 and 3, and they are similar to the expected impacts for currently permitted mining.

Groundwater

Mining the LBA Tract would impact the groundwater resource quantity in two ways: 1) Mining would remove the coal aquifers and any overburden aquifers on the mined land and replace them with unconsolidated spoils; and 2) water levels in the coal and overburden aquifers adjacent to the mine would continue to be depressed as a result of seepage and dewatering from the open cut on the LBA Tract. The area subject to lower water levels would be increased roughly in proportion to the increase in area affected by mining.

Mining the LBA Tract would remove shallow aquifers on an additional 5,364 acres (Proposed Action), 5,465 acres (Alternative 2), or 3,689 acres (Alternative 3) and replace the separate aquifer units with spoil composed of an unlayered mixture of the shale, siltstone, and sand that make up the existing Wasatch Formation overburden and Fort Union Formation interburden. Impacts to the local groundwater system resulting from mining include completely dewatering the coal, overburden and interburden within the area of coal removal, and extending drawdowns some distance away from the active mine area. The extent that drawdowns will propagate away from the mine pits is a function of the water-bearing properties of the aquifer materials. In materials with high transmissivity and low storativity, drawdowns will extend further from the pit face than in materials with lower transmissivity and higher storage. In general, due to the geologic makeup of the Wasatch Formation overburden (discontinuous sands in a matrix of shale), overburden drawdowns do not extend great distances from the active mine pit (Hydro Engineering 1997, 1998, 1999). Of the three overburden wells monitored by JRCC during 1999-2000, no significant water level changes were observed.

Because of the regional continuity and higher transmissivity within the Wyodak coal seam, drawdowns propagate much further in the coal aquifer than in the overburden. Within the vicinity of Jacobs Ranch Mine, however, coal transmissivity is generally low, and the coal aquifer is unconfined. The combination of unconfined water levels in a low transmissivity aquifer results in very little drawdown in the Wyodak coal seam in the vicinity of Jacobs Ranch Mine. Coal drawdowns from 1980 to

1995 are generally less than five ft within one mile of the active pits at the Jacobs Ranch Mine (Hydro-Engineering 1996a).

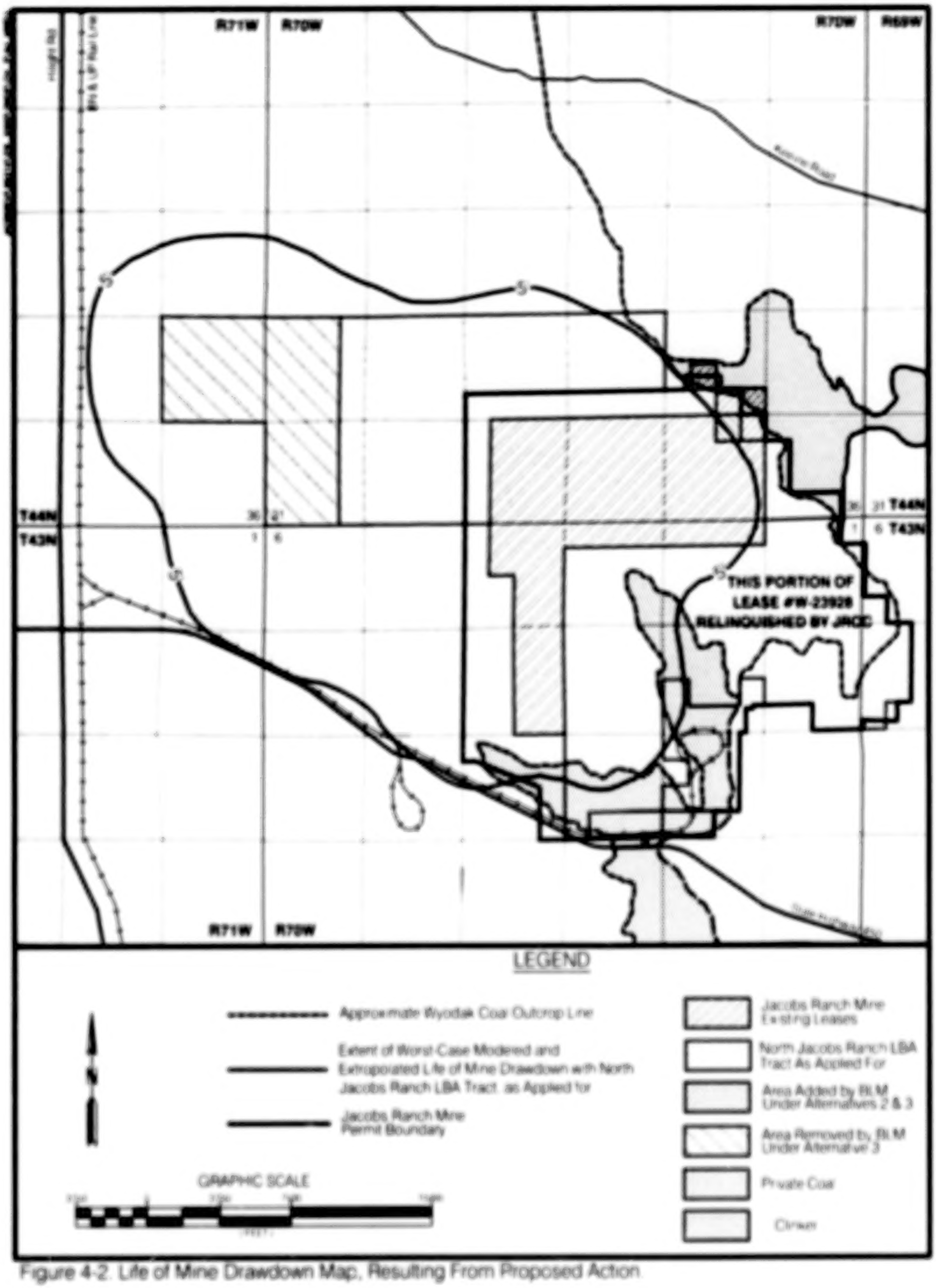
In 1999 JRCC monitored water levels in 4 monitor wells in the Wyodak coal seam, one well completed in both coal and underburden, and three wells completed in clinker adjacent to the Wyodak coal. Water levels and maps showing drawdowns in the immediate vicinity of the pit are included in each year's annual report to WDEQ/LQD (JRCC 1995-1999). As expected, drawdowns in the coal seam are a function of distance from the pit as well as geologic and hydrologic barriers and boundaries such as crop lines, fracture zones, and recharge sources. The maximum drawdown measured in a coal monitor well is about 18 feet; no drawdown has been recorded in the coal/underburden monitoring well or in any of the scoria monitoring wells.

JRCC used the MODFLOW model to predict the extent of water drawdown in the Wyodak coal seam as a result of mining at the Jacobs Ranch Mine. The results of the groundwater modeling are reported in the Baseline Hydrology Section in Addendum D6G of the Jacobs Ranch Mine 271-T4 permit document (JRCC 1999a). Predicted drawdowns over the life of mine are shown on Figure 4-2. These predictions are approximate and were based on extrapolation of JRCC's earlier predictions by extending the drawdowns westward and northward by the dimensions of the North Jacobs Ranch Tract. More precise predictions of the extent of drawdowns will be required in order to amend the North Jacobs Ranch LBA Tract into the WDEQ/LQD permit area.

Wyoming SEO records indicate a total of 368 permitted water wells located within three miles of the LBA Tract. The majority (192) are owned by coal mining companies and are used for groundwater monitoring and water supply. Of the 176 non mine-related wells, 56 are permitted for stock watering only, 45 are permitted for both CBM development and stock watering, 34 are permitted for CBM development only, 28 are permitted for miscellaneous uses, eight are permitted for either stock or domestic use, two are for industrial use and one is permitted for irrigation use.

Some of these wells will likely be impacted (either directly by removal of the well or indirectly by water level drawdown) by approved mining operations occurring at Jacobs Ranch and the adjacent mines. In compliance with SMCRA and Wyoming regulations, mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality; this mitigation is thus part of the action alternatives. The most probable source of replacement water would be one of the aquifers underlying the coal.

For the current mine area (without the North Jacobs Ranch LBA Tract), JRCC determined that the effects of the predicted drawdown on possible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LEGEND
Approximate Wyodak Coal Outcrop Line
Extent of Worst-Case Modeled and Extrapolated Life of Mine Drawdown with North Jacobs Ranch LBA Tract, as Applied for
Jacobs Ranch Mine Permit Boundary
Jacobs Ranch Mine Existing Leases
North Jacobs Ranch LBA Tract As Applied For
Area Added by BLM Under Alternatives 2 & 3
Area Removed by BLM Under Alternative 3
Private Coal
Clinker
GRAPHIC SCALE
N

Figure 4-2. Life of Mine Drawdown Map, Resulting From Proposed Action

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neighboring groundwater users would be negligible. This determination was based on the finding that there were no known water users withdrawing water solely from the Wyodak coal seam within the area of the 5-foot drawdown contour (JRCC Permit 214 T-4 Permit Document, Mine Plan, Section MP4.5.4.10, November, 1999).

In May 2000 the files of the SEO were searched to determine whether the preceding statement would still be true for the 5-foot drawdown as extrapolated on Figure 4-2 to consider mining of the North Jacobs Ranch LBA Tract. As within the current mine area, no permitted water supply wells were found within the expanded 5-foot drawdown contour with completion depths that indicated they produce water from the Wyodak coal seam (this excludes wells constructed only for the purpose of monitoring or CBM production. During the permitting process, the mine operator would be required to update the list of potentially impacted wells and predict impacts to these and other water-supply wells within the 5-foot drawdown contour. The operator would be required to commit to replacing these water supplies with water of equivalent quality and quantity if they are affected by mining.

The subcoal Fort Union aquifers are not removed or disturbed by coal mining, so they are not directly impacted by coal mining activity. JRCC has three water supply wells completed in aquifers below the coal. If the LBA Tract is leased by the applicant, water would be produced from these wells for a longer period of time, but JRCC would not require additional sub-coal wells to mine the LBA Tract.

Mining would also impact groundwater quality; the TDS in the water resaturating the backfill is generally higher than the TDS in the groundwater before mining. This is due to the exposure o! fresh overburden surfaces to groundwater that moves through the reclaimed spoils. Research conducted by the Montana Bureau of Mines and Geology on the coal fields of the northern PRB (Van Voast and Reiten 1988) indicates that upon initial saturation, mine backfill is generally high in TDS and contains soluble salts of calcium, magnesium and sodium sulfates. As the backfill resaturates, the soluble salts are leached by groundwater inflow and TDS concentrations tend to decrease with time, indicating that the long term groundwater quality in mined and off-site lands would not be compromised (Van Voast and Reiten 1988).

Groundwater quality within the backfill aquifer at the North Jacobs Ranch LBA Tract would be expected to be similar to the groundwater quality measured in existing wells completed in the backfill at the Jacobs Ranch Mine. To date, three wells have been installed to monitor water level and water quality in backfilled spoils at the Jacobs Ranch Mine. In February 1999 TDS concentrations in the three wells were, 4,370, 4,800 and 4,750 mg/L. TDS concentrations observed in the Jacobs Ranch Mine backfill monitoring wells are generally higher than those found in the undisturbed Wasatch Formation overburden or Wyodak coal aquifers. Using data compiled from ten surface coal mines in the eastern PRB, Martin et al. (1988) concluded that backfill groundwater quality improves markedly after the backfill is leached with one pore volume of water. The same conclusions were reached by Van Voast and Reiten (1988) after analyzing data from the Decker and Colstrip Mine areas in the northern PRB. Postmining groundwaters are therefore expected to be of better quality after one pore volume of water moves through the backfill than what is observed in the backfill today. In general, the mine backfill groundwater TDS can be expected to range from 3,000 - 6,000 mg/L, similar to the premining Wasatch Formation aquifer, and meet Wyoming Class III standards for use as stock water.

The hydraulic properties of the backfill aquifer reported in permit documents of the nearby Black Thunder Mine are comparable to the Wasatch Formation overburden and Wyodak coal. At the Black Thunder Mine, the backfill aquifer has been tested at two wells, and the hydraulic conductivity in both wells is 1.1 ft/day, which exceeds the average hydraulic conductivity (0.14 ft/day) reported for the Wyodak coal in the vicinity of the Jacobs Ranch Mine. The data available indicate that the hydraulic conductivity of the backfill would be greater than or equal to premining coal values, suggesting that wells completed in the backfill would provide yields greater than or equal to premining coal wells.

Direct and indirect impacts to the groundwater system resulting from mining the LBA Tract would add to the cumulative impacts that will occur due to mining existing leases. These impacts are discussed in section 4.5.5.

4.1.6 Alluvial Valley Floors

The North Jacobs Ranch LBA Tract has not yet been evaluated for the presence of AVF's. However, based on previous non-AVF declarations made on Mills and Shipley Draws downstream of the North Jacobs Ranch LBA Tract, it is unlikely that these channels would receive AVF declarations in their headwater areas, where the drainages are immature and AVF characteristics are negligible. The nearest declared AVF is located on North Prong Little Thunder Creek more than 2 miles downstream from the confluence of Mills and Shipley Draws.

Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining, but they must be restored as part of the reclamation process. In order to restore the AVF, the physical and hydrologic characteristics of the AVF must be determined.

If the LBA Tract is mined as an extension of existing operations, the mining would extend upstream on streams already in active mine areas. Therefore, no direct, indirect, or cumulative impacts are anticipated to off-site AVF's through mining of the LBA Tract.

4.1.7 Wetlands

As discussed in Chapter 3, JRCC has completed a wetlands inventory and submitted it to COE. This inventory identified the acres of jurisdictional wetlands on the North Jacobs Ranch LBA Tract (Section 3.8). Existing wetlands located in the LBA Tract would be destroyed by mining operations. COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Replacement of functional wetlands on privately-owned surface may occur in accordance with agreements with the private landowners; no federal surface lands are included in the North Jacobs Ranch LBA Tract. During the period of time after mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not duplicate the exact function and landscape features of the premine wetlands, but replacement would be in accordance with the requirements of Section 404 of the Clean Water Act, as determined by COE.

4.1.8 Vegetation

Under the Proposed Action, mining of the LBA Tract would progressively remove the native vegetation on 5,364 acres on and near the LBA Tract. Acreage disturbed under Alternative 2 would be 5,465 acres, and acreage disturbed under Alternative 3 would be 3,689 acres. Short-term impacts associated with this vegetation removal would include increased soil erosion and habitat loss for wildlife and livestock. Potential long-term impacts include loss of habitat for some wildlife species as a result of reduced species diversity, particularly big sagebrush, on reclaimed lands. However, grassland-dependent wildlife species and livestock would benefit from the increased grass cover and production.

Reclamation, including revegetation of these lands, would occur contemporaneously with mining on adjacent lands, i.e., reclamation would begin once an area is mined. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to four years. This would be longer for areas occupied by stockpiles, haulroads, sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until the end of mining. No new life-of-mine facilities would be located on the LBA Tract under the Proposed Action or Alternatives 2 and 3, in which the LBA Tract would be mined as an extension of the existing Jacobs Ranch Mine. Grazing restrictions prior to mining and during reclamation would remove up to 100 percent of the LBA area from livestock grazing. This reduction in vegetative production would not seriously affect livestock production in the region, and long-term productivity on the reclaimed land would return to premining levels within several years following seeding with the approved final seed mixture. Wildlife use of the area will not be restricted throughout the operations.

Re-established vegetation would be dominated by species mandated in the reclamation seed mixtures (to be approved by WDEQ). The majority of the approved species are native to the LBA Tract. Initially, the reclaimed land would be dominated by grassland vegetation which would be less diverse than the premining vegetation. At least 20 percent of the area would be reclaimed to native shrubs at a density of one per square meter as required by current regulations. Estimates for the time it would take to restore shrubs to premining density levels range from 20 to 100 years. An indirect impact of this vegetative change could be decreased big game habitat carrying capacity. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond (a minimum of ten years), a diverse, productive, and permanent vegetative cover would be established on the LBA Tract. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity. Private landowners (Figure 3-9) would have the right to manipulate the vegetation on their lands as they desire once the reclamation bond is released.

On average, about 460 acres of surface disturbance per year of mining would occur on the LBA Tract at the proposed rate of production regardless of which action alternative is selected. By the time mining ceases, over 75 percent of these disturbed lands would have been reseeded. The remaining 25 percent would be reseeded during the following two to three years as the life-of-mine facilities areas are reclaimed.

The reclamation plans for the existing mine include steps to control invasion by weedy (invasive nonnative) plant species. The reclamation plans for the North Jacobs Ranch LBA Tract would also include steps to control invasion from such species. Native vegetation from surrounding areas would gradually invade and become established on the reclaimed land.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts would severely hamper revegetation efforts, since lack of sufficient moisture would reduce germination and could damage newly established plants. Same-aged vegetation would be more susceptible to disease than would plants of various ages. Severe thunderstorms could also adversely affect newly seeded areas. Once a stable vegetative cover is established, however, these events would have similar impacts as would occur on native vegetation.

Changes expected in the surface water network as a result of mining and reclamation would affect the re-establishment of vegetation patterns on the reclaimed areas to some extent. The postmining maximum slope would be 20 percent in accordance with WDEQ policy. The average reclaimed slope will not be known until WDEQ's technical review of the permit revision application is complete. No significant changes in average slope are predicted.

Following reclamation, the LBA Tract would be primarily mixed prairie grasslands with graminoid/forb-dominated areas, and the overall species diversity would be reduced, especially for the shrub component. Jurisdictional wetlands would fall under the jurisdiction of the COE. Detailed wetland mitigation plans would be developed at the permitting stage to ensure no net loss of jurisdictional wetlands on the project area. Functional wetlands may be restored in accordance with the requirements of the surface landowner; there are no public lands included in the North Jacobs Ranch LBA Tract.

The decrease in plant diversity would not seriously affect productivity of the reclaimed areas, regardless of the alternative selected, and the proposed postmining land use (wildlife habitat and rangeland) would be achieved even with the changes in vegetative species composition and diversity.

4.1.9 Threatened, Endangered and Candidate Plant Species

Refer to Appendix F.

4.1.10 Wildlife

Local wildlife populations are directly and indirectly impacted by mining. These impacts are both short-term (until successful reclamation is achieved) and long-term (persisting beyond successful completion of reclamation). The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. Displaced animals may find equally suitable habitat that is not occupied by other animals, occupy suitable habitat that is already being used by other individuals, or occupy poorer quality habitat than that from which they were displaced. In the second and third situations, the animals may suffer from increased competition with other animals and are less likely to survive and reproduce. The indirect impacts are longer term and may include a reduction in big game carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

These impacts are currently occurring on the existing leases as mining occurs. If the LBA Tract is leased under the Proposed Action, Alternative 2, or Alternative 3, the

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area of mining disturbance would be extended onto the LBA Tract and mining would be extended by up to 12.3 years at the Jacobs Ranch Mine.

Under the Proposed Action, Alternative 2, or Alternative 3, big game would be displaced from portions of the LBA Tract to adjacent ranges during mining. Pronghorn would be most affected; however, none of the area within two miles of the LBA Tract has been classified as crucial or critical pronghorn habitat. Mule deer would not be substantially impacted, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas. Elk would not be affected, although they have been observed wintering on grasslands southeast of the LBA Tract in recent years. Big game displacement would be incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game residing in the adjacent areas could be impacted by increased competition with displaced animals. Noise, dust and associated human presence would cause some localized avoidance of foraging areas adjacent to mining activities. On the existing leases, however, big game have continued to occupy areas adjacent to and within active mine operations, suggesting that some animals may become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. There would be more restrictions on big game movement on or through the tract, however, due to additional fences, spoil piles, and pits related to mining. During winter storms, pronghorn may not be able to negotiate these barriers. WDEQ guidelines require fencing to be designed to permit pronghorn passage to the extent possible.

Road kills related to mine traffic would be extended in the area by up to 12.3 years.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA Tract. Sagebrush would gradually become re-established on the reclaimed land, but the topographic changes would be permanent.

Medium-sized mammals (such as rabbits, coyotes, and foxes) would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality. However, these animals would quickly rebound on reclaimed areas, as forage developed and small mammal prey species recolonized. Direct losses of small mammals would be higher than for other wildlife, since the mobility of small mammals is limited and many retreat into burrows when disturbed. Therefore, populations of such prey animals as voles and mice would decline during mining. However, these animals have a high reproductive potential and tend to re-invade and adapt to reclaimed areas quickly.

Sage grouse are yearlong residents and are found on lands adjacent to the LBA Tract. An active lek was observed in April and May of 1999 at a location near the northern border of the LBA Tract (Figure 3-8, Section 3.10). The two-mile radius from the lek, which identifies the area in which most hens will nest, overlaps onto the LBA Tract. This lek has been active from 1993 through 1999. Sage grouse were rarely observed using the LBA Tract during the July 1999 field survey, but were observed on adjacent lands. The impacts from mining the LBA Tract would be the temporary loss of nesting habitat and some disturbance to breeding activities when the mining operations are within close proximity to the birds' strutting ground. Monitoring of sage grouse activities indicates that the birds frequently change lek sites. It is likely that if mining activities disturb a lek, sage grouse will use an alternate lek site for breeding activities. Should the sage grouse establish a lek on the proposed lease area, the lessee would be required to take appropriate mitigation steps prior to mining. Effort will also be made to reestablish shrubs on reclaimed lands, grading of reclaimed lands to create swales and depressions, and continued monitoring of sage grouse activity in the area before, during and after mining. These and other measures will be further developed in the WDEQ/LQD Permit to Mine application.

Mining the LBA Tract will not impact regional raptor populations; however, individual birds or pairs may be impacted. Due to a lack of suitable nesting habitat (cliffs and tall trees), very few raptor species have been observed nesting on or near the proposed lease area. As noted in Section 3.10.4, a total of five raptor species (the burrowing owl, great horned owl, ferruginous hawk, Swainson's hawk and American kestrel) have been identified nesting within two miles of the LBA Tract. In 1999 only five nest sites in this area were active and included one ferruginous hawk nest, two Swainson's hawk nests and two burrowing owl nests. Only two species (the Swainson's hawk and the ferruginous hawk) have been recorded nesting on the LBA Tract under the Proposed Action. In 1999, the ferruginous hawk had the most nest sites, but all of those nests belonged to the same pair of birds. Mining activity could cause raptors to abandon nests proximate to disturbance. USFWS and WDEQ/LQD approval will be required before mining may occur within one-half mile of any future or adjacent active raptor nests. There is an approved raptor mitigation plan for the existing Jacobs Ranch Mine. The Jacobs Ranch Mine annually monitors territorial occupancy and nest productivity. Raptor nesting activity has frequently occurred in active mining and construction areas and Jacobs Ranch Mine has successfully executed state-of-the-art mitigation techniques to protect nest productivity. This monitoring and mitigation plan, as required by the USFWS and WDEQ/LQD, will be applied to the North Jacobs Ranch LBA Tract if it is leased. Mining near raptor territories will minimally impact availability of raptor forage species. At the adjacent Jacobs Ranch Mine, lack of nesting habitat, not a lack of forage area, has been determined to be the most important factor limiting raptor density. During mining, nesting habitat is created by the excavation process (highwalls), as well as through enhancement efforts (nest platforms and boxes). After mining, the reclamation plan will reestablish the ground cover necessary for the return of a suitable prey base.

Displaced songbirds would have to compete for available adjacent territories and resources when their habitats are disturbed by mining operations. Where adjacent habitat is at carrying capacity, this competition would result in some mortality. Losses would also occur when habitat disturbance coincides with egg incubation and rearing of young. Impacts of habitat loss would be short-term for grassland species, but would last longer for tree- and shrub-dependent species. Several required measures would minimize these impacts. A diverse seed mixture planted in a mosaic with a shrubland phase would provide food, cover, and edge effect.

Waterfowl and shorebird habitat on the LBA Tract is minimal, and production of these species is very limited. Mining the LBA Tract would thus have a negligible effect on migrating and breeding waterfowl. Sedimentation ponds created during mining would provide interim habitat for these fauna. WDEQ and the COE would also require mitigation of any disturbed wetlands during reclamation, which would minimize impacts.

No fish habitat will be impacted on the proposed lease.

The impacts discussed above would apply to the three action alternatives.

4.1.11 Threatened, Endangered, and Candidate Wildlife Species

Refer to Appendix F.

4.1.12 Land Use and Recreation

The major adverse environmental consequences of the Proposed Action, Alternative 2 or Alternative 3 on land use would be reduction of livestock grazing, loss of wildlife habitat, and curtailment of oil and gas development on about 5,364 acres (Proposed Action), or about 5,465 acres (Alternative 2), or about 3,689 acres (Alternative 3) during active mining. Wildlife (particularly big game) and livestock (cattle and sheep) use would be displaced while the tract is being mined and reclaimed.

Sections 3.11 and 4.1.2 of this document address the total number of producing, abandoned or shut in oil and gas, and CBM wells that presently exist on the LBA Tract under the Proposed Action, Alternative 2, and Alternative 3. Well location information, federal oil and gas ownership, and federal oil and gas lessee information are presented in Figure 3-10 and Table 3-8. Conflict could arise between the oil and gas (conventional and/or CBM) and the coal lease holders. BLM manages federal lands on a multiple use basis, in accordance with the regulations. BLM recently issued a policy statement on conflicts between CBM and coal development (BLM Instruction Memorandum No. 2000-081) which advocates optimizing the recovery of both coal and CBM resources to ensure that the public receives a reasonable return for the publicly owned resources. Optimal recovery of both coal and oil and gas resources requires negotiation and cooperation between the oil and gas lessees and the coal lessees. If the lessees do not reach agreement on how to coordinate recovery of both resources, then the CBM resources would be lost during mining, or the mining would be postponed. If the mining is postponed too long, the coal may not be recovered. Royalties are lost to both the state and federal governments if conventional oil and gas wells are abandoned prematurely, if the federal CBM is not recovered prior to mining or if federal coal is not recovered due to conflicts. State and federal governments can also lose bonus money when the costs of the agreements between the lessees are factored into the fair market value determinations.

As discussed in Section 1.2 of this document, none of the lands included in the LBA Tract under any of the alternatives are managed by the USFS. Therefore, no federal land would be removed from public access if the North Jacobs Ranch LBA Tract is leased.

Hunting on the LBA Tract would be eliminated during mining and reclamation. Pronghorn, mule deer, and elk occur on and adjacent to the tract. Sage grouse, mourning dove, waterfowl, rabbit, and coyote also inhabit the tract.

Following reclamation, the land would be suitable for grazing and wildlife uses, which are the historic land uses. There are no BLM or USFS public lands included in the LBA Tract, but the reclamation standards required by SMCRA and Wyoming State Law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in the State of Wyoming. Following reclamation bond release, management of the privately-owned surface would revert to the private surface owner.

4.1.13 Cultural Resources

All portions of the Proposed Action area and buffer zone were subjected to a Class III inventory and assessment in 1999.

Table 3-9 (Section 3.12) summarizes the distribution of cultural sites by type. Data recovery plans are required for those sites recommended eligible to the National Register following testing and consultation with the SHPO. Until full consultation has occurred, identifying the sites for mitigation or release, sites recommended eligible or of undetermined eligibility must be protected.

Impacts to eligible or unevaluated cultural resources cannot be permitted. If unevaluated sites cannot be avoided, they must be evaluated prior to disturbance. If eligible sites cannot be avoided, a data recovery plan must be implemented prior to disturbance. Ineligible properties may be destroyed without further work.

The eligible sites on the North Jacobs Ranch LBA Tract which cannot be avoided or which have not already been subjected to data recovery action would be carried forward in the mining and reclamation plan as requiring protective stipulations until a testing, mitigation or data recovery plan is developed to address the impacts to the sites. The Wyoming SHPO would consult with the lead federal and state agencies on the development of such plans and the manner in which they are carried out.

Cultural resources adjacent to the mine areas may be impacted as a result of increased access to the areas. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits outside of but adjacent to mine permit areas.

4.1.14 Native American Concerns

No sites of Native American religious or cultural importance are known to occur on the LBA Tract. If such sites or localities are identified at a later date, appropriate action must be taken to address concerns related to those sites.

4.1.15 Paleontological Resources

No unique or significant paleontological resources have been identified on the LBA Tract, and the likelihood of encountering significant paleontological resources is small. Lease and permit conditions require that should previously unknown, potentially significant paleontological sites be discovered, work in that area shall stop and measures be taken to assess and protect the site (see Appendix D).

4.1.16 Visual Resources

Mining activities on most of the North Jacobs Ranch LBA Tract would not be visible from any major travel routes and would be partly concealed by surrounding terrain. Mining of some parts of the LBA Tract would be visible from State Highway 450.

Mining would affect landscapes classified by USFS as "common" and landscape character would not be significantly changed following reclamation. No unique visual resources have been identified on or near the North Jacobs Ranch LBA Tract.

Reclaimed terrain would be almost indistinguishable from the surrounding undisturbed terrain. Slopes might appear smoother (less intricately dissected) than undisturbed terrain to the north and west, and sagebrush would not be as abundant for several years; however, within a few years after reclamation, the mined land would not be distinguishable from the surrounding undisturbed terrain except by someone very familiar with landforms and vegetation.

4.1.17 Noise

Noise levels on the LBA Tract would be increased considerably by mining activities such as blasting, loading, hauling, and possibly in-pit crushing. Since the LBA Tract would be mined as an extension of existing operations under the action alternatives, no rail car loading would take place on the LBA Tract. The Noise Control Act of 1972 indicates that a 24-hour equivalent level of less than 70 dBA prevents hearing loss and that a level below 55 dBA, in general, does not constitute an adverse impact. OSM prepared a noise impact report for the Caballo Rojo Mine (OSM 1980) which determined that the noise level from crushers and a conveyor would not exceed 45 dBA at a distance of 1,500 ft. Explosives would be used during mining to fragment the overburden and coal and facilitate their excavation. The air overpressure created by such blasting is estimated to be 123 dBA at the location of the blast. At a distance of approximately 1,230 ft, the intensity of this blast would be reduced to 40 dBA. Since the nearest occupied dwelling is over one mile away from the LBA Tract, there should be no significant noise impacts.

Because of the remoteness of the site and because mining is already ongoing in the area, noise would have little off-site effect. Wildlife in the immediate vicinity of mining may be adversely affected; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to increased noise associated with active coal mining. After mining and reclamation are completed, noise would return to premining levels.

4.1.18 Transportation Facilities

No new or reconstructed transportation facilities would be required under the Proposed Action or Alternatives 2 and 3. Essentially all of the coal mined on the LBA Tract would be transported by rail. Vehicular traffic to and from the mine would continue at existing or slightly higher levels for an additional 12.3 or 7.6 years, depending on which alternative is selected.

Active pipelines currently cross the LBA Tract, and any relocation of these pipelines would be handled according to specific agreements between the coal lessee and the pipeline owners if the need arises. The Wyoming Department of Transportation routinely monitors traffic volumes on area highways, and if traffic exceeds design standards improvements are made. Burlington Northern-Santa Fe and Union Pacific have upgraded and will continue to upgrade their rail capacities to handle the increasing coal volume projected from the southern PRB with or without the leasing of the proposed LBA Tract.

4.1.19 Socioeconomics

Leasing and subsequent mining of the LBA Tract would extend the life of the already permitted Jacobs Ranch Mine by 12.3 to 7.6 years, depending on which alternative is selected.

Coal prices are currently projected to remain relatively constant throughout the life of the mine (WSGS 2000). Assuming a price of $4.00 per ton, the revenue from the sale of the recoverable coal from the LBA Tract would total $1.87 billion for the Proposed Action (467.1 million tons of coal), or $1.88 billion for Alternative 2 (471 million tons of coal), or $1.14 billion for Alternative 3 (285.3 million tons of coal). Some of this money from the sale of this federal coal would be paid to federal, state and local governments in the form of taxes and federal production royalties, as discussed below.

The federal government would collect a royalty at the time the coal is sold. This royalty is 12.5 percent of the sale price of the coal. This would amount to approximately $234 million under the Proposed Action, $236 million under Alternative 2, or $142 million under Alternative 3. This money would be split equally between the state and federal governments. The federal government would also collect black lung and reclamation taxes based on the sale of the coal.

According to a study done by the University of Wyoming (UW 1994), the State of Wyoming received about $1.10 per ton from the sale of PRB coal produced in 1991. The taxes and royalties included in this calculation were severance taxes, ad valorem taxes, sales and use taxes, and the state's share of federal royalty payments on production (discussed above). Under this scenario, the estimated total direct return to the State of Wyoming from the production of this federal coal, in current dollars, would be $513.8 million under the Proposed Action, $518.1 million under Alternative 2, or $313.8 million under Alternative 3. This figure includes half of the federal royalty discussed above.

The federal government also receives a bonus payment at the time the federal coal is leased. Bonus payments on the federal coal leases issued in the Powder River Basin since 1990 have ranged from 11.1 cents per ton to 38.3 cents per ton. This range of bonus payments would represent a potential bonus payment range of $35 million to $199 million for the estimated federal coal tonnage in the North Jacobs Ranch LBA Tract. The actual amount the federal government would receive would depend on the alternative selected and the actual bonus bid if the tract is leased. The bonus payment would be payable over five years and would be divided equally with the State of Wyoming.

If the LBA Tract is leased under an action alternative and coal production increases as projected, JRCC anticipates that total employment at the Jacobs Ranch Mine would increase by up to 18 employees, which would result in a total employment of 368 at the Jacobs Ranch Mine over the 7.6 to 12.3 years the tract is being mined. Eighteen persons represent less than one tenth of one percent of the 27,603 persons in the August 2000 labor force in Campbell and Converse Counties (Wyoming Department of Employment, Employment Resources Division, October 2000). The August 2000 unemployment in these counties was about 898. No additional demands on the existing infrastructure or services in these communities would be expected because no influx of new residents would be needed to fill new jobs. The economic stability of the communities of Douglas, Wright, and Gillette would benefit by having the Jacobs Ranch Mine employees living in their communities employed for an additional 7.6 to 12.3 years.

Issues relating to the social, cultural, and economic well-being and health of minorities and low-income groups are termed Environmental Justice issues. In reviewing the impacts of the Proposed Action and Alternatives 2 and 3 on socioeconomic resources, surface water and groundwater quality, air quality, hazardous materials, or other elements of the human environment in this chapter, it was determined that potentially adverse impacts do not disproportionately affect Native American tribes, minority groups and/or low-income groups.

With regard to Environmental Justice issues affecting Native American tribes or groups, the general analysis area contains no tribal lands or Native American communities, and no treaty rights or Native American trust resources are known to exist for this area.

Implementing any of the alternatives would have no effects on Environmental Justice issues, including the social, cultural, and economic well-being and health of minorities and low income groups within the general analysis area.

4.1.20 Hazardous and Solid Waste

If JRCC acquires the North Jacobs Ranch LBA Tract, the wastes that would be generated in the course of mining the tract would be similar to the wastes that are currently being generated by the existing mining operation. The procedures that are used for handling hazardous and solid waste at the existing Jacobs Ranch Mine are described in Chapter 2. Wastes generated by mining the LBA Tract would be handled in accordance with the existing regulations using the procedures currently in use at the Jacobs Ranch Mine, as described in Chapter 2.

4.2 No-Action Alternative

Under the No-Action Alternative, the coal lease application would be rejected and the area contained in the application would not be offered for lease at this time. For the purposes of this analysis, the No-Action Alternative assumes that these lands would never be mined. However, the approved mining operations for the existing Jacobs Ranch Mine would not be changed if this alternative is chosen. The impacts described on the preceding pages and in Table 2-2 to topography and physiography, geology and minerals, soils, air quality, water resources, alluvial valley floors, wetlands, vegetation, wildlife, threatened, endangered and candidate species, land use and recreation, cultural resources, Native American concerns, paleontological resources, visual resources, noise, transportation, and socioeconomics would occur on the existing Jacobs Ranch coal lease under the No-Action Alternative, but these impacts would not be extended onto the LBA Tract.

The general nature and magnitude of cumulative impacts as summarized in Table 2-3, which would occur from implementation of the Proposed Action or Alternatives 2 or 3, would not be substantially different under the No-Action Alternative. However, coal removal and the associated disturbance and impact would not occur on the 5,364, 5,465 or 3,689 additional acres disturbed in the Proposed Action, Alternative 2, or Alternative 3, respectively. A portion of the North Jacobs Ranch LBA Tract adjacent to the existing Jacobs Ranch Mine would be disturbed to recover the coal in the existing leases. The economic benefits that would be derived from mining the LBA Tract during an additional 12.3 years of mining would be lost. If a decision is made not to lease this tract at this time, it could be leased and mined as a maintenance lease in the future, while the existing adjacent mines are in operation. If it is not leased while the existing adjacent mines are in operation, it is potentially large enough to be leased and mined by a new operation in the future.

4.3 Regulatory Compliance, Mitigation, and Monitoring

In the case of surface coal mining, SMCRA and state law require a considerable amount of mitigation and monitoring. Measures that are required by regulation are considered to be part of the Proposed Action and Alternatives 2 and 3. These requirements, mitigation plans, and monitoring plans are in place for the No-Action Alternative, as part of the current approved mining and reclamation plan for the existing Jacobs Ranch Mine. If the North Jacobs Ranch LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining and reclamation plan covering the North Jacobs Ranch LBA Tract. This mining and reclamation plan would have to be approved before mining could occur on the tract, regardless of who acquires the tract. The major mitigation measures and monitoring measures that are required by state or federal regulation are summarized in Table 4-3. More specific information about some of these mitigation and monitoring measures and their results at the North Jacobs Ranch Mine are described in the following sections of this document:

- Section 4.1.2, handling of unsuitable overburden material;
- Section 4.1.4, air quality monitoring practices and results and application of BACT for mitigation of air quality impacts;
- Section 4.1.5, surface water hydrologic control measures;

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Table 4-3. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), Alternative 2, or Alternative 3.

RESOURCE	**Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]**	**MONITORING[1]**
Topography & Physiography	Restoring to approximate original contour or other approved topographic configuration	LQD checks as built vs. approved topography with each annual report.
Geology & Minerals	Identifying & selectively placing or mixing chemically or physically unsuitable overburden materials to minimize adverse effects to vegetation or groundwater	LQD requires monitoring in advance of mining to detect unsuitable overburden.
Soil	Salvaging soil suitable to support plant growth for use in reclamation; Protecting soil stockpiles from disturbance and erosional influences; Selectively placing at least 4 ft of suitable overburden on the graded spoil surface below replaced topsoil to meet guidelines for vegetation root zones	Monitoring vegetation growth on reclaimed areas to determine need for soil amendments. Sampling regraded overburden for compliance with root zone criteria.
Air Quality	Dispersion modeling of mining plans for annual average particulate pollution impacts on ambient air; Using particulate pollution control technologies; Using work practices designed to minimize fugitive particulate emissions; Using EPA- or state-mandated BACT, including: Fabric filtration or wet scrubbing of coal storage silo and conveyor vents, Watering or using chemical dust suppression on haul roads and exposed soils, Containment of truck dumps and primary crushers; Covering of conveyors, Prompt revegetation of exposed soils	On site air quality monitoring for PM_{10} or TSP; Off site ambient monitoring for PM_{10} or TSP; On site compliance inspections
Surface Water	Building and maintaining sediment control ponds or other devices during mining; Restoring approximate original drainage patterns during reclamation; Restoring stock ponds and playas during reclamation	Monitoring storage capacity in sediment ponds; monitoring quality of discharges; monitoring streamflows and water quality.
Groundwater Quantity	Evaluating cumulative impacts to water quantity associated with proposed mining; Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quantity	Monitoring wells track water levels in overburden, coal, interburden, underburden, & backfill

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Jacobs Ranch Mine in its current approved mining and reclamation plan (the No Action Alternative). If the North Jacobs Ranch LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the North Jacobs Ranch LBA Tract that must be approved before mining can occur on the tract under the Proposed Action, Alternative 2 or 3.

Table 4-3. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), Alternative 2, or Alternative 3. (Continued)

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Groundwater Quality	Evaluating cumulative impacts to water quality associated with proposed mining. Replacing existing water rights that are interrupted, discontinued, or diminished by mining with water of equivalent quality	Monitoring wells track water quality in overburden, coal, interburden, underburden, & backfill
Alluvial Valley Floors	Identifying all alluvial valley floors that would be affected by mining; Determining significance to agriculture of all identified alluvial valley floors affected by mining (WDEQ); Protecting downstream alluvial valley floors during mining; Restoring essential hydrologic function of all alluvial valley floors affected by mining.	Monitoring to determine restoration of essential hydrologic functions of any declared AVF
Wetlands	Identifying all wetlands that would be affected by mining; Identifying jurisdictional wetlands (COE); Replacing all jurisdictional wetlands that would be disturbed by mining Replacing functional wetlands as required by surface managing agency or surface land owner	Monitoring of reclaimed wetlands using same procedures used to identify premining jurisdictional wetlands.
Vegetation	Permanently revegetating reclaimed areas according to a comprehensive revegetation plan using approved permanent reclamation seed mixtures consisting predominantly of species native to the area; Reclaiming 20% of reclaimed area with native shrubs at a density of one per square meter; Controlling erosion on reclaimed lands prior to seeding with final seed mixture using mulching, cover crops, or other approved measures; Chemically and mechanically controlling weed infestation; Direct hauling of topsoil; Selectively planting shrubs in riparian areas; Planting sagebrush; Creating depressions and rock piles; Using special planting procedures around rock piles; Posting reclamation bond covering the cost of reclamation	Monitoring of revegetation growth & diversity until release of final reclamation bond (minimum 10 years). Monitoring of erosion to determine need for corrective action during establishment of vegetation. Use of controlled grazing during revegetation evaluation to determine suitability for postmining land uses.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Jacobs Ranch Mine in its current approved mining and reclamation plan (the No-Action Alternative). If the North Jacobs Ranch LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the North Jacobs Ranch LBA Tract that must be approved before mining can occur on the tract under the Proposed Action, Alternative 2 or 3.

Table 4-3. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), Alternative 2, or Alternative 3. (Continued)

RESOURCE	**Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law**[1]	**MONITORING**[1]
Wildlife	Restoring premining topography to the maximum extent possible; Planting a diverse mixture of grasses, forbs and shrubs in configurations beneficial to wildlife; Designing fences to permit wildlife passage; Raptor-proofing power transmission poles; Creating artificial raptor nest sites; Increasing habitat diversity by creating rock clusters and shallow depressions on reclaimed land; Cottonwood plantings along reclaimed drainages; Replacing drainages, wetlands and alluvial valley floors disturbed by mining; Reducing vehicle speed limits to minimize mortality; Instructing employees not to harass or disturb wildlife; Preparing raptor mitigation plans	Baseline & annual wildlife monitoring surveys; Monitoring for Migratory Birds of High Federal Interest
Threatened, Endangered, & Candidate Species	Avoiding bald eagle disturbance; Restoring bald eagle foraging areas disturbed by mining; Restoring mountain plover habitat disturbed by mining; Using raptor safe power lines; Surveying for Ute ladies' tresses; Surveying for mountain plover; Searching for black-footed ferrets if prairie dogs move onto tract;	Baseline and annual wildlife monitoring surveys
Land Use	Suitably restoring reclaimed area for historic uses (grazing and wildlife);	Monitoring of controlled grazing prior to bond release evaluation.
Cultural Resources	Conducting Class I & III surveys to identify cultural properties on all state and federal lands and on private lands affected by federal undertakings; Consulting with SHPO to evaluate eligibility of cultural properties for the NRHP; Avoiding or recovering data from significant cultural properties identified by surveys, according to an approved plan; Notifying appropriate federal personnel if historic or prehistoric materials are uncovered during mining operations; Instructing employees of the importance of and regulatory obligations to protect cultural resources	Monitoring of mining activities during topsoil stripping; cessation of activities and notification of authorities if unidentified sites are encountered during topsoil removal.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Jacobs Ranch Mine in its current approved mining and reclamation plan (the No-Action Alternative). If the North Jacobs Ranch LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the North Jacobs Ranch LBA Tract that must be approved before mining can occur on the tract under the Proposed Action, Alternative 2 or 3.

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Table 4-3. Regulatory Compliance, Mitigation and Monitoring Measures required under the Proposed Action, Alternative 1 (No Action), Alternative 2, or Alternative 3. (Continued)

RESOURCE	Regulatory Compliance or Mitigation Required by Stipulations or Required by State or Federal Law[1]	MONITORING[1]
Native American Concerns	Notifying Native American tribes with known interest in this area of leasing action and request for help in identifying potentially significant religious or cultural sites	No specific monitoring program
Paleontological Resources	Notifying appropriate federal personnel if potentially significant paleontological sites are discovered during mining	No specific monitoring program
Visual Resources	Restoring landscape character during reclamation through return to approximate original contour and revegetation with native species	No specific monitoring program
Noise	Protecting employees from hearing loss	MSHA inspections
Transportation Facilities	Relocating existing pipelines, if necessary, in accordance with specific agreement between pipeline owner and coal lessee.	No specific monitoring program
Socioeconomics	Paying royalty and taxes as required by federal, state, and local regulations.	Surveying and reporting to document volume of coal removed.
Hazardous & Solid Waste	Disposing of solid waste and sewage within permit boundaries according to approved plans; Storing and recycling waste oil; Maintaining of files containing Material Safety Data Sheets for all chemicals, compounds, and/or substances used during course of mining; Ensuring that all production, use, storage, transport, and disposal of hazardous materials is in accordance with applicable existing or hereafter promulgated federal, state, and government requirements; Complying with emergency reporting requirements for releases of hazardous materials as established in CERCLA, as amended; Preparing and implementing spill prevention control and countermeasure plans, spill response plans, inventories of hazardous chemical categories pursuant to Section 312 of SARA, as amended; Preparing emergency response plans;	No specific monitoring other than required by these other regulations and response plans.

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[1] These requirements, mitigation plans, and monitoring plans are in place for the existing Jacobs Ranch Mine in its current approved mining and reclamation plan (the No Action Alternative). If the North Jacobs Ranch LBA Tract is leased, these requirements, mitigation plans, and monitoring plans would be part of a mining plan revision covering the North Jacobs Ranch LBA Tract that must be approved before mining can occur on the tract under the Proposed Action, Alternative 2 or 3.

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- Section 4.1.5, groundwater quantity and quality monitoring measures and results;
- Section 4.1.5, mitigation for interruption, discontinuation, or diminishment of existing water well rights by mining operations;
- Section 4.1.6, restoration of AVF's impacted by mining;
- Section 4.1.7, identification and replacements of wetlands impacted by mining;
- Section 4.1.8, plans for control of invasive, nonnative plant species;
- Section 4.1.10, fencing designed to permit pronghorn passage;
- Section 4.1.10, notification and mitigation measures to protect active raptor nests and nest productivity;
- Section 4.1.10, mitigation measures to minimize habitat loss impacts to songbirds;
- Section 4.1.13, protection of cultural resources that are recommended eligible for or of undetermined eligibility for the National Register of Historic Places; and
- Appendix F, protection of threatened and endangered species.

If impacts are identified during the leasing process that are not mitigated by existing required mitigation measures, BLM can include additional mitigation measures, in the form of stipulations on the new lease, within the limits of its regulatory authority. In general, the levels of mitigation and monitoring required for surface coal mining by SMCRA and Wyoming state law are more extensive than those required for other surface disturbing activities; however, concerns are periodically identified that are not monitored or mitigated under existing procedures. One issue of current concern is the release of NO_x from blasting, and the resulting formation of low-lying orange clouds that can be carried outside the mine permit areas by wind. As a result of this concern, industry and agency representatives have met and discussed possible causes and solutions, including improving blasting techniques or explosives, reducing powder factors, and analyzing the composition of the orange clouds, and these procedures are being evaluated. In their scoping comments, EPA suggested only allowing blasting to occur during daylight hours when radiational inversions do not exist. BLM is not involved in the regulation of blasting activities at the coal mines in the Powder River Basin. However, BLM would support an evaluation of this suggestion to answer the following questions:

- what is the correspondence between the blasting events of concern and these radiational inversion events?;
- how frequently do radiational inversions occur that would preclude blasting per EPA's suggestion?; and
- are there clear, reasonable, enforceable criteria that would unequivocally identify radiational inversion events that would preclude blasting per EPA's suggestion?

BLM also supports the steps that the mines have taken to notify the public of blasting events.

After reviewing the required mitigation and monitoring in the current Jacobs Ranch Mine Mining and Reclamation Permit and the historical monitoring results in the Jacobs Ranch Mine annual mine reports, the BLM has not identified additional special stipulations that should be added to the BLM lease or areas where additional or increased monitoring measures are recommended.

4.4 Residual Impacts

Residual impacts are unavoidable impacts that cannot be mitigated and would therefore remain following mining and reclamation.

4.4.1 Topography and Physiography

Topographic moderation is a permanent consequence of mining. The indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent.

4.4.2 Geology and Minerals

Geology from the base of the coal to the surface would be subject to significant, permanent change.

4.4.3 Soils

Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining. This would result in long-term alteration of soil characteristics.

4.4.4 Air Quality

No residual impacts to air quality would occur following mining.

4.4.5 Water Resources

The area where groundwater drawdowns and replacement of coal and overburden with spoils occur would be increased under the action alternatives compared to what would occur without the addition of the LBA Tract. The postmining backfill may take in excess of 100 years to reach equilibrium water levels and water quality. Less time would be required near the mining boundaries. Water level and water quality in the backfill would be suitable to provide water to wells for livestock use, but would be different from premining conditions.

4.4.6 Alluvial Valley Floors

No residual impacts to alluvial valley floors would occur following mining.

4.4.7 Wetlands

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetland.

4.4.8 Vegetation

Reclaimed vegetative communities may never completely match the surrounding native plant community.

4.4.9 Wildlife

Although the LBA Tract would be reclaimed to be as near original condition as possible, there would be some residual wildlife impacts. The topographic moderation would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species.

4.4.10 Threatened, Endangered, and Candidate Species

No residual impacts to T&E or candidate species are expected.

4.4.11 Land Use and Recreation

No residual impacts to land use and recreation are expected.

4.4.12 Cultural Resources

Cultural sites that are determined to be eligible for the NRHP and that cannot be avoided are destroyed by surface coal mining after data from those sites is recovered. Sites that are not eligible for the NRHP are lost.

4.4.13 Native American Concerns

No residual impacts to Native American concerns have been identified.

4.4.14 Paleontological Resources

No residual impacts to significant paleontological resources are expected.

4.4.15 Visual Resources

No residual impacts to visual resources are expected.

4.4.16 Noise

No residual impacts to noise are expected.

4.4.17 Transportation Facilities

No residual impacts to transportation facilities are expected.

4.4.18 Socioeconomics

No residual impacts to socioeconomics are expected.

4.5 Cumulative Impacts

Cumulative impacts result from the incremental impacts of an action added to other past, present, and reasonably foreseeable future actions, regardless of who is responsible for such actions. Cumulative impacts can result from individually minor, but collectively significant, actions occurring over time.

This section briefly summarizes the cumulative impacts that are occurring as a result of existing development in the area being mined and considers how those impacts would change if the North Jacobs Ranch LBA Tract is leased and mined and if other proposed development in the area occurs.

Important points to keep in mind include: 1) the total areas of all mines would not be disturbed at

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once; 2) the number of acres, type of vegetation, etc., disturbed would vary from year to year; 3) the impacts to groundwater would vary as mining progresses through each permit area (depending on saturation, how close the next mine pit is, etc.); and 4) the intensity and extent of CBM development is speculative.

Since decertification of the Powder River Federal Coal Region in 1990, the Wyoming State Office of the BLM has held thirteen competitive coal lease sales and issued ten new federal coal leases containing approximately 2.747 billion tons of coal using the LBA process (Table 1-1). This leasing process has undergone the scrutiny of two appeals to the Interior Board of Land Appeals and one audit by the General Accounting Office.

The Wyoming BLM has pending applications for eight additional maintenance tracts for existing mines containing about 2.3 billion tons of coal (Table 1-2). Two of the pending applications were reviewed by the PRRCT in 1999 and were recommended for processing (Belle Ayr 1997 and North Jacobs Ranch).

BLM completed one exchange in the Powder River Basin in 2000, authorized by Public Law 95-554. Under this exchange, EOG resources (formerly Belco) received a federal lease for a 106-million ton portion of the Hay Creek Tract adjacent to the Buckskin Mine in exchange for the rights to a 170-million ton coal lease near Buffalo, Wyoming that is unmineable due to construction of Interstate Highway 90 (BLM 1999b).

The Wyoming and Montana BLM state offices completed a study entitled "*Powder River Basin Status Check*" in 1996 (BLM 1996f). The purpose of this study was to document actual mineral development impacts in the PRB from 1980 to 1995 and compare them with mineral development impacts that were predicted to occur by 1990 in the five previously prepared PRB regional EIS's. Portions of the status check were updated prior to the 1997 and 1999 PRRCT public meetings in Casper, Wyoming and Billings, Montana.

Four of the previously prepared regional EIS's evaluated coal development in the PRB in Wyoming. They are:

Final Environmental Impact Statement, Eastern Powder River Basin of Wyoming, BLM, October 1974;

Final Environmental Impact Statement, Proposed Development of Coal Resources in the Eastern Powder River Basin of Wyoming, BLM, March 1979;

Final Powder River Regional Coal Environmental Impact Statement, BLM, December, 1981; and

Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region, BLM, January 1984.

For Wyoming, the status check compared actual development in Campbell and Converse counties with predictions in the 1979 and 1981 Final EIS's, and USGS Water

Resources Investigations Report 88-4046, entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin*" (Martin, et al., 1988), which is frequently referred to as "the CHIA."

Since 1989, coal production in the Powder River Basin has increased by an average of 6.8 percent per year. The increasing state production is primarily due to increasing sales of low-sulfur, low-cost PRB coal to electric utilities who must comply with Phase I requirements of Title III of the 1990 Clean Air Act Amendments. Electric utilities account for 97 percent of Wyoming's coal sales.

The currently operational mines in Campbell and northern Converse Counties are shown in Figure 1-1. Their current status and ownership are shown in Table 4-4. There have been numerous changes in mine ownership during the last decade, and this has resulted in mine consolidations and mine closings within the basin.

The mines are located just west of the outcrop of the Wyodak coal, where the coal is at the shallowest depth. The mines in Campbell and Converse counties produce 85 to 95 percent of the coal produced in Wyoming each year. Table 4-5 summarizes predicted coal mining activity (from the 1979 and 1981 regional EIS's) with actual activity that has occurred since the EIS's were prepared.

Campbell and Converse counties' oil production decreased to 17.9 million barrels of oil in 1999 from 32.8 million barrels in 1992, a 45.4 percent decrease. Currently, oil prices are increasing and it is unclear if this trend of decreasing oil production will continue in the foreseeable future.

Natural gas production has been increasing, particularly in Campbell County, due to the development of shallow CBM resources west of the coal mines. CBM exploration and development is currently ongoing throughout the PRB in Wyoming, and it is estimated that as of October 2000 there were more than 5,000 productive wells in place. Most of these wells have been drilled in Campbell County. Since the early 1990's, the BLM has completed numerous EAs and two EISs analyzing CBM projects. The last EIS was the Wyodak CBM Project EIS, which was completed in 1999. The Wyodak EIS project area included 3,600 square miles of mixed federal, state, and private lands. The EIS analyzed the impacts of drilling and producing up to 5,000 new federal, state, and private CBM wells in addition to the 890 wells that had been evaluated in previous NEPA documents. BLM is currently preparing an EA to analyze the impacts of drilling as many as 2,500 additional federal drainage protection wells within the Wyodak EIS project area. These wells would be drilled and produced to prevent the loss of federal CBM resources and corresponding royalties from undrilled federal oil and gas leases

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Table 4-4. Status of Wyoming Powder River Basin Coal Mines

2000 Mine	1994 Mine Operator	Coal Production[1] 1993 Actual[2]	1994 Permitted[2]	1999 Mine Operator	Coal Production[1] 1999 Actual[3]	2000 Permitted[4]	Status/Comments
Buckskin	SMC (Zeigler)	11.18	24.0	Vulcan Coal	15.59	22.0	Active
Clovis Point	Kerr-McGee	0	4.0	Wyodak Resources	0	4.0	Mine shut down/leases relinquished or sold, facilities sold, Wyodak has AQD permit
Dry Fork	Phillips/WFA	3.28	15.0	WFA	1.22	15.0	Active
Eagle Butte	Cyprus Amax	16.70	29.6	RAG American	17.42	35.0	Active
Fort Union	Fort Union Ltd	0.06	9.3	Kennecott/Kfx	0.03	9.4	Active
Rawhide	Carter (Exxon)	9.86	24.0	Peabody	0.81	24.0	Shut down
Wyodak	Wyodak Resources	3.03	10.0	Wyodak Resources	3.18	10.0	Active
NORTHERN MINE GROUP TOTALS		**44.11**	**115.9**		**38.25**	**119.4**	
Belle Ayr	Cyprus Amax	15.59	25	RAG American	17.89	45	Active
Caballo/N. Caballo	Carter (Exxon)/ Western Energy	15.42	40	Peabody	26.47	40	Active/Caballo Mine + former Rocky Butte & West Rocky Butte leases
Cordero Rojo	Kennecott/ Drummond	21.01	44	Kennecott	45.67	65	Active/Cordero + Caballo Rojo Mines
Coal Creek	ARCO	0.11	18	Arch	11.23	18	Active
CENTRAL MINE GROUP TOTALS		**52.13**	**127**		**101.26**	**168**	
Antelope	Kennecott	7.29	12	Kennecott	22.69	30	Active
Black Thunder	ARCO	34.32	36	Arch	48.67	100	Active
Jacobs Ranch	Kerr McGee	18.39	25	Kennecott	29.08	50	Active
N. Antelope/ Rochelle	Peabody	32.94	50	Peabody	38.87	75	Active/North Antelope Mine + Rochelle Mine
N. Rochelle	SMC (Zeigler)	0.02	8	Vulcan Coal	8.17	35	Active/facilities constructed in 1998-99
SOUTHERN MINE GROUP TOTALS		**92.96**	**131**		**177.48**	**290**	
TOTALS FOR 3 MINE GROUPS		**1[illegible].2**	**373.9**		**316.99**	**577.4**	

[1] Actual production (million tons) on left, permitted production (million tons) on right.
[2] Source: Wyoming State Geological Survey *GEO-NOTES*, August 1994
[3] Source: Wyoming State Inspector of Mines *ANNUAL REPORT* for 1999
[4] Source: Judy Shamley, WDEQ/AQD, personal communication November 6, 2000. Figures are permitted capacity as of October [illegible] 2000

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Table 4-5. Coal Production and Development Levels, Campbell and Converse Counties, Wyoming

	Coal Production (Million Tons)	**Number of Active Coal Mines**	**Number of Existing Power Plants**	**Number of Active Coal Enhancement Facilities**	**Direct Coal Employment**	**Average Price-NE Wyoming**
1979 Predictions for 1990	174.3	15	2	1	3,889	na
1981 Predictions for 1990	318.4	37	3	1	11,900	na
Actual 1990	162.6	18	3	1	2,862	$6.86
Actual 1994	216.9	19	4	1	3,126	$5.62
Actual 1995	246.5	19	4	1	3,177	$5.60
Actual 1996	261.1	18	4	2	3,274	$5.40
Actual 1997	264.1	18	4	2	3,164	$5.03
Actual 1998	297.5	16	4	2	3,348	$4.73
Actual 1999	319.9	15[1]	4	2	3,362	$4.66

Existing Power Plants:	PP&L Dave Johnson, PP&L Wyodak, Black Hills Simpson #1, and Black Hills Simpson #2
Proposed New Power Plants	NAPG Two Elk, Zeigler ENCOAL, and Calpine & Black Hills Wygen #1
Existing Coal Enhancement:	ENCOAL-Buckskin (inactive), KFx-Fort Union (active), and Wyodak Zartheo (active)

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[1] Includes the Dave Johnson Mine, which is not included in Table 4-4.

Sources: 1979 and 1981 BLM Powder River Basin Regional EISs, Wyoming State Geological Survey Geo-notes 1996-99, and Wyoming State Inspector of Mines Annual Reports, 1990-99.

that are adjacent to and potentially being drained by wells drilled on private or state oil and gas leases. BLM is also preparing an EIS to analyze the cumulative impacts of reasonably foreseeable CBM and conventional oil and gas development within the Wyoming portion of the PRB. The EIS will analyze the potential impacts of proposed additional CBM development in the Wyoming portion of the basin and update the BLM planning documents in the area of CBM development interest. The regional coal EIS's (BLM 1974, 1979, 1981, 1984) and the Buffalo RMP (BLM 1985) analyzed oil and gas development, but did not anticipate that the oil and gas development would include production of CBM resources.

Under the current process for approving CBM drilling, CBM wells can be drilled on private and state oil and gas leases after approval by the Wyoming Oil and Gas Conservation Commission and the Wyoming State Engineer's Office. On federal oil and gas leases, BLM must analyze the individual and cumulative environmental impacts of all drilling, as required by NEPA, before CBM drilling on the federal leases can be authorized. Approximately 88 percent of the coal rights in the Wyodak CBM project area are federal, but only about half of the oil and gas rights in this area are federal. A June 7, 1999 Supreme Court decision (98-830) assigned the rights to develop CBM on a piece of land to the owner of the oil and gas rights.

Other mineral development levels in the Wyoming PRB are currently lower than predicted in the EIS's. In the 1970's, significant uranium development was anticipated in southwest Campbell County and northwest Converse County. This development did not materialize because the price of uranium dropped in the early 1980's. There are currently two *in situ* uranium operations in Converse and Johnson counties, but no mines and no mills. There were three active *in situ* operations in the PRB in 1999, but one of them, located in southeastern Johnson County, has since ceased operations. Uranium production has been increasing in recent years, but is expected to decrease this year because prices are decreasing due to international purchases of Russian uranium from stockpiles and decommissioning of uranium-based weapons (WSGS 2000).

Scoria is quarried for use as road surfacing material, primarily by coal mines but also by a few excavation and construction firms. Bentonite is mined in parts of the Wyoming PRB, but not in Campbell or Converse Counties.

The proposed North Jacobs Ranch LBA Tract is situated within a nearly continuous corridor of five coal mines (counting the North Antelope/ Rochelle Complex as one mine) in northern Converse and southern Campbell counties, Wyoming (see Figure 3-1). This southern mine corridor is approximately 24 miles long and eight miles wide. Production of coal in this southern mine group

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began in 1977 at the Black Thunder Mine. The current maximum permitted production rate for these five mines is 290 million tons per year (Table 4-4). Eight maintenance leases, including approximately 20,954 acres of federal coal, have been issued to mines in this southern group since decertification (Jacobs Ranch, West Black Thunder, North Antelope/Rochelle, Antelope, North Rochelle, Powder River, Thundercloud, and Horse Creek--see Table 1-1). There are also five pending maintenance leases including approximately 17,400 acres of federal coal in this group of mines (North Jacobs Ranch, NARO, Little Thunder, West Roundup, and West Antelope--see Table 1-2).

CBM wells have been drilled around the Jacobs Ranch, Black Thunder, and North Antelope/Rochelle mines. Production from these wells has been delayed for a while pending completion of additional pipelines in this area. CBM drilling and production is expected to continue in the areas around the coal mines, and on the LBA's. Due to the proximity of the coal mining and CBM production operations, cumulative impacts to groundwater, surface water, air quality and wildlife are likely to occur as more CBM resources are developed west of the southern mine group. These potential impacts are discussed in the following cumulative impact discussion for these resources.

In addition to the ongoing coal mining and leasing and the CBM development, three other projects are in progress or planned during preparation of this EIS in the vicinity of the southern mine group: 1) construction and operation of the Two Elk Power Plant east of the Black Thunder Mine; 2) construction of Wygen #1 power plant which has been proposed at the Wyodak Mine site; and 3) construction and use of the proposed DM&E rail line. A fourth project, the ENCOAL facility, which at one time was scheduled for construction at the North Rochelle Mine, has been indefinitely delayed. The Two Elk, and DM&E projects, due to their locations, could have directly overlapping impacts with the impacts of mining the North Jacobs Ranch LBA Tract. The proposed Wygen#1 plant would be located at the Black Hills Corporation energy complex near Gillette, Wyoming, and the impacts of mining the North Jacobs Ranch LBA Tract would not be expected to overlap with the impacts of building and operating this power plant.

Two Elk would be a coal-fired power plant located east of Black Thunder Mine and would generate 250 Mw. The plant would burn low-Btu "waste coal" and coal fines from nearby mines as well as sub-bituminous coal in a pulverized coal boiler. This ability to burn low Btu waste coal and fines would allow the Two Elk plant to recover fuel values that might otherwise be lost and thereby generate electric power more efficiently than existing coal-fired plants. Coal and waste coal would be transported from the mine to the power plant by direct truck haul on unpaved roads, and ash would be returned to the mine by enclosed, 4-

wheel off-highway trucks. An application for an air quality Permit to Construct was submitted to WDEQ and was deemed administratively complete on August 5, 1997. The Two Elk project received a Permit to Construct from WDEQ/AQD on February 27, 1998. On February 17, 2000 the applicant was granted a permit modification by WDEQ/AQD. The modification allows for relocation of the plant based on soils and geotechnical considerations and also changes the original power plant design. The permittee has two years from the date of issuance to begin construction. No final decisions have been made as to how much water would be used, or where it would be obtained. Various scenarios for "wet" and "dry" operations are being evaluated at this time. Other permits that will be obtained include a wastewater permit from WDEQ and various construction and waste disposal permits from the state and county. An EIS will also be necessary to address the transmission line and access road, which both cross lands under USFS jurisdiction. According to a recent article in the Gillette News Record, construction could begin on this plant in 2000 (Gillette News Record 2000a).

The Black Hills Wygen #1 power plant would be a coal-fired power plant located near Gillette, Wyoming which would generate 80 Mw. According to a September 27, 2000 press release, the plant would burn approximately 500,000 tons of low-sulfur coal annually. The coal could be mined at the adjacent Wyodak Mine. The plant is expected to be operational by January, 2003, and Black Hills estimates that the project will employ about 300 people during the construction period.

The Surface Transportation Board preliminarily approved the DM&E Railroad expansion plan (to build 262 miles of new track in the Powder River Basin and to rehabilitate 650 miles of track across South Dakota and Minnesota) on December 11, 1998. The approval was made pending the completion of an analysis of the environmental impacts of the project. The Surface Transportation Board released the draft EIS for public comment in September 2000. The DM&E had proposed to start construction in 1999 and complete the new railroad line in 2001; however, final approval and construction cannot take place until after the environmental analysis is completed. The proposed route in Wyoming will generally follow along the Cheyenne River valley.

The status check identified one part of the coal mining process where the actual levels of development did not agree with the predictions, and this was the number of acres reclaimed. In general, coal mine reclamation efforts have been successful in both the Wyoming and Montana portions of the basin; however, as indicated in Table 4-6, the regional EIS's assumed that reclamation would proceed at a faster pace than has actually occurred.

Table 4-6 compares the 1979 and 1981 predictions of surface coal mining disturbance and reclamation areas with actual disturbance and

Table 4-6. Predicted and Actual Coal Mine Disturbance and Reclamation, Campbell and Converse Counties, Wyoming.

Year	Surface Coal Mining Disturbance (Acres)*	Surface Coal Mining Reclamation (Acres)**	Percent Reclaimed
1979 EIS Prediction for 1990	22,794	12,666	55.57%
1981 EIS Prediction for 1990	48,400	34,100	70.45%
Actual 1990	31,797	6,994	22.00%
Actual 1996	47,018	12,165	25.87%
Actual 1999-2000***	56,737	16,868	29.73%

* Includes all disturbance, including mine facilities, rail facilities, roads, sedimentation ponds, etc.

** Includes only acres seeded with permanent seed mixture, not all acres currently being reclaimed.

*** Source: Mark Humphries, OSM, Casper.

reclamation areas. The numbers are not directly comparable because the EIS estimates excluded acres of disturbance occupied by mine facilities but the actual numbers that are reported include acres of disturbance occupied by mine facilities. To make them more comparable, the number of actual disturbed acres would be decreased to reflect the acres at each mine occupied by mine and rail facilities, roads, etc.; however those numbers have not been available for all mines in the annual reports. Also, since reclamation is a process involving many steps, and seeding with the final seed mixture happens near the end of the process, Table 4-6 shows the area that is currently almost completely reclaimed but it does not show the total number of acres that are being reclaimed at this time.

The development of reclamation schedules for PRB mines must take into account various unique factors:

- Very thick coal seams;
- Diverse premining topography;
- Surface-mining methods using trucks and shovels combined with draglines; and
- Large-volume material movements.

These factors affect the amount of reclamation that can be accomplished at any given time.

Achievement of final postmine topography immediately following mining is not always possible. The mining plan dictates the backfill placement and timing sequence and must take into account changing strip ratios which create material surpluses or deficits. Stockpiling, which may be required to fill final pit voids or store new pit boxcut material, affects the backfill material balance. Operating changes can also affect the backfill placement timing and sequence. Some examples include changing the pit direction to conform to lease configuration, changing plans to accommodate production growth and changes in technology or mining method. The achievement of contemporaneous reclamation is evaluated on a site-by-site basis by the WDEQ taking the mining complexities unique to each mine into account.

Currently, WDEQ/LQD suggests to operators that only large, contiguous areas such as drainage basins be considered for bond release, with the assurance that the area will not be disturbed in the future. Because many mine plans cross a drainage basin several times during the life of mine, final reclamation of the drainage may not occur until late in the life of mine. This issue is further complicated when two operators are mining in the same drainage on different reclamation schedules, in that bond release for the first operator to mine the basin could be held until the second operator's portion of the basin is reclaimed. Due to the uncertainties involved the process of applying for and receiving final bond release, most companies are electing to postpone the initiation of bond release until late in the life of mine.

For the southern group of mines, approximately 33 percent of the area of disturbance has been seeded with a final seed mixture. At Jacobs Ranch Mine, 413.7 acres were disturbed in 1999 and 259.1 acres were seeded to the permanent vegetation species. Cumulatively through February 19, 2000, more than sixty percent of the area disturbed at the Jacobs Ranch Mine had been reclaimed (5,747.1 acres had been disturbed at Jacobs Ranch Mine and 3,456.7 acres had been reclaimed). The Jacobs Ranch Mine has final bond release on 68 acres.

4.5.1 Topography and Physiography

Following surface coal mining and reclamation, topography will be modified in an elongated corridor east of and paralleling Highway 59 from just north of Gillette, Wyoming, south for about 75 miles. The topography in the PRB is characterized by relatively flat or rolling topography. After reclamation, these characteristics will be emphasized in the reclaimed area. Premining features that were more topographically unique (e.g., steeper hills and gullies, rock outcrops, etc.) will generally be smoothed. The reduction in topographic diversity may lower the carrying capacity for big game in the reclaimed areas; however, big game ranges are generally very large and mining activities are, in general, not located in habitats defined as crucial. The overall flattening and lowering of the topography would result in increased infiltration of surface water and reduced peak flows from the drainages. These changes would not be significant because the streams typically flow from west to east across the area rather than north to south along the entire corridor. Therefore, only a small part of each stream's drainage area would be disturbed (see Section 4.5.5). There would be no significant cumulative impacts to topography and physiography due to the proximity of coal mining, CBM development, and the proposed construction of the railroad line and ENCOAL and Two Elk power plants in this area because the construction and operation of those projects would cause minimal topographic and/or physiographic changes.

4.5.2 Geology and Minerals

The PRB coal region encompasses an area of about 20,000 mi^2 and contains nearly 240 billion tons of sub-bituminous coal resources (BLM 1979). Converse County has a total area of 4,050 mi^2 of which slightly less than one percent is within current permit boundaries. Campbell County has a total area of about 4,760 mi^2, of which approximately four percent is within current mine permit boundaries. Coal mining in this area disturbs about 2,000 acres annually with about 1,850 acres reclaimed annually (BLM 1996g). Mining and reclamation rates are expected to continue to increase through the year 2015, but the balance between reclamation and mining should remain about the same. In the PRB, the coal reserves currently leased represent a small percentage of the total coal reserves but a large percentage of the shallowest (hence the most economical to recover) coal reserves. Within the five southern mines, approximately 42,600 acres of federal coal are currently leased. This is about a 57 percent increase over the 27,160 acres of federal coal that were leased in the southern group of mines in 1990, prior to decertification. Under the Proposed Action, approximately 4,821 additional acres of federal coal would be leased, which would represent an 11 percent increase in the area of leased federal coal in the southern group of five mines. The area of disturbance associated with mining these leases, which would be greater than the leases themselves, is discussed in other parts of this analysis (e.g., section 4.5.3).

Coal and CBM are non-renewable resources that form as organic matter decays and undergoes chemical changes over geologic time. The CBM and coal resources that are removed or would be used to generate heat or power and would not be available for use in the future. Based on the information that is currently available, removal of the CBM and water from the coal prior to mining it does not damage the coal. Construction of the proposed railroad line and power plants would not impact the geology or mineral resources in the area, so there would be no overlapping impacts related to these projects.

4.5.3 Soils

The five existing southern mines would disturb approximately 63,500 acres throughout their combined lives (they would disturb about 1,200 acres annually during active mining at the currently planned mining rates). This estimate includes the North Rochelle, Powder River, Thundercloud and recently leased Horse Creek LBA tracts. If the North Jacobs Ranch LBA Tract is leased and mined, the disturbance area in the southern group of mines would increase to approximately 69,000 acres. This would represent an additional 8.6 percent increase in disturbance. Assuming ten years from initial disturbance to utilization of a parcel of reclaimed land by domestic livestock, approximately 12,000 acres (16.6 percent disturbed by Jacobs Ranch) would be unavailable for such use at any given time during active mining. However, the replaced topsoil would support a stable and productive native vegetation community adequate in quantity and quality to support planned postmining land uses (i.e., wildlife habitat and rangeland).

Additional, although less extensive, soil disturbance would be associated with the proposed CBM development west of the mines, and with construction of the proposed power plants and railroad line.

4.5.4 Air Quality

According to current regulatory standards by which air quality is defined, surface mining and CBM development in the PRB have not resulted in impacts to air quality that have exceeded federal or state standards.

Based on predictive models conducted for PRB mines, mining operations do not have significant off-site particulate pollution impacts, even when production and pollution from neighboring mines are considered. However, this prediction has been based on the assumptions that mining activities are sufficiently removed from the permit boundaries and that neighboring mines are not actively mining in the immediate vicinity (within 0.6-2.5 miles). Previous modeling (BLM 1992a) has shown that incremental particulate pollution impacts decrease to insignificant levels ($< 1\ \mu g/m^3\ PM_{10}$ annual average) within six miles of active mining.

In cases where mines are in close proximity (within two mi), WDEQ follows a modeling protocol which accounts for all mine-generated particulate air pollutants from all nearby mines to determine impacts to ambient air quality. Known as the "Mine A/Mine B" modeling procedure, this model evaluates the total impacts of a given mining operation, including those impacts from and on neighboring mines. In past modeling conducted in support of Jacobs Ranch Mine's air quality permit, the Jacobs Ranch Mine has been subject to Mine A/Mine B protocol. If the LBA Tract is leased under the Proposed Action or Alternatives 2 or 3 and past procedures are followed, WDEQ would require that ambient air quality modeling be conducted at the Jacobs Ranch and Black Thunder Mines for consideration of incorporation of the North Jacobs Ranch LBA Tract on air quality. The modeling protocol is restricted as a matter of state regulatory policy to evaluation of the average annual impacts with respect to the ambient standard of $<50\ \mu g/m^3$ PM_{10}. The Wyoming air quality standard is $50\ \mu g/m^3$ which includes $15\ \mu g/m^3$ background concentration.

A regional cumulative impact analysis was performed in 1999 for the Horse Creek LBA EIS to estimate impacts on air quality in the year 2015 from the Proposed Action and all other reasonably foreseeable actions. This analysis consisted of an update and modification to the May 1999 Wyodak CBM Project DEIS far-range cumulative air quality analysis (BLM 1999a, Greystone 1999). The cumulative air quality impacts were further updated in the recently released Draft EIS for the DM&E Railroad Powder River Basin Expansion Project. The changes in air emissions due to mining the North Jacobs Ranch lease as an extension of Jacobs Ranch Mine would be a change in the location of Jacobs Ranch Mine emissions, a change in production from 30 million tons per year without the North Jacobs Ranch LBA Tract to the permitted capacity of 39 million tons per year with the North Jacobs Ranch LBA Tract, and a longer duration of mining activity at the Jacobs Ranch Mine. Therefore, no significant change in long-term cumulative air impacts are anticipated if the North Jacobs Ranch LBA Tract is leased and mined as a maintenance lease for the Jacobs Ranch Mine.

The regional (far-range) cumulative air quality analysis was carried out using the CALMET/CALPUFF Version 5 model. Modeling was performed to estimate impacts of NO_x, SO_2 and particulate matter emissions on air quality, regional haze, and air quality related values (AQRVs) at Class I and sensitive Class II areas within approximately 150 miles (240 km) of Gillette, Wyoming. The area included in the model analysis is shown in Figure 4-3. The model analysis results presented in this section represent an indication of potential impacts based on currently available modeling technology and anticipated levels of activity in the year 2015 (see discussion below).

Cumulative Emissions Inventory

An inventory of incremental air pollutant emissions was prepared using 1995 as the base year and 2015 as the analysis year. The inventory utilized data assembled for the Wyodak CBM Project cumulative analysis, but included a number of updates and revisions to incorporate newly available information. The inventory included a breakdown of particulate matter emissions into three sub-groups: elemental carbon particles (EC), organic carbon particles (OC), and other undifferentiated particles, including fugitive dust (PM_{10}). The carbon particles, which are emitted primarily from diesel engines (mine equipment and trains), were treated separately

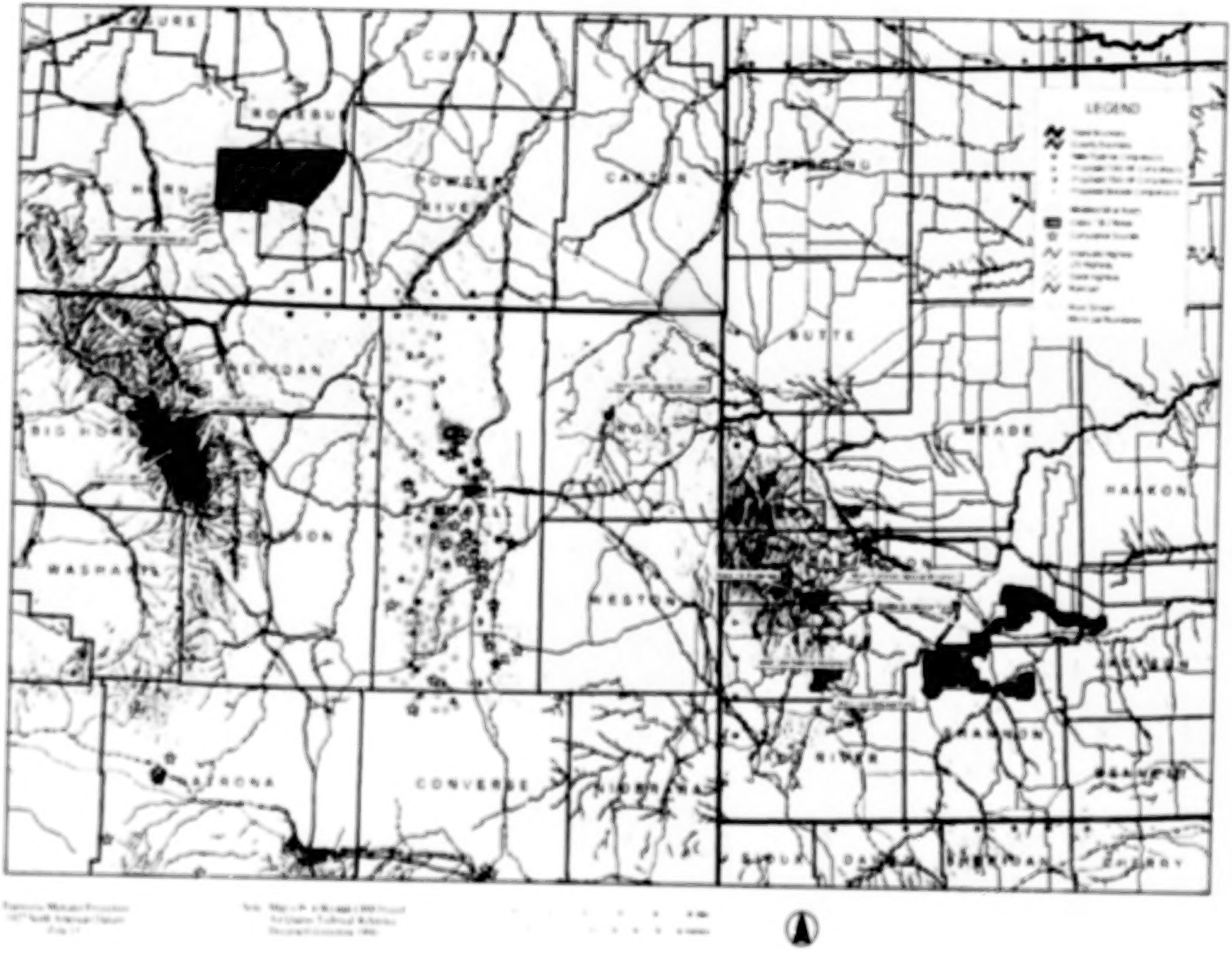

Figure 4-3. Cumulative Air Quality Modeling Domain.

because of their potential impact on regional haze. SO_2 emissions from blasting, trains and other diesel engines were also included, again because of potential regional haze impacts.

The four groups of air emission sources that were inventoried and the sources of emissions data relied upon are described below.

- All stationary point sources that began operation after 1995 and/or are permitted and reasonably expected to be operating after 1995. All permitted point source information was based upon state agency files, as obtained for the Wyodak CBM Project DEIS (BLM 1999a).

- Potential incremental increase in surface coal mining emissions. Coal production in the year 2015 is projected to total 387 million tons per year for the PRB mines listed in Table 4-5 (Resource Data International 1998). This is about 15 percent more than the 1999 production and about 71 percent of the 1999 permitted production for active mines shown in Table 4-4. The permitted production is the regulatory limit based on present air quality permits. Thus, the reasonably foreseeable 2015 coal production assumed for the analysis represents about 71 percent of 1999 maximum permitted production.

Incremental coal production from 1995 to 2015 was calculated for each of the 14 PRB mines active after 1999 (Table 4-4) by assuming each mine would produce 71 percent of 1999 permitted production. Emission increases for each pollutant were estimated based on the ratio of emissions to coal production as shown by the most recent air quality evaluation for each mine, or for a similar mine if recent data were unavailable. Planned major changes in mine plans (e.g. use of conveyors to replace haul trucks) were taken into account where applicable.

NO_x is produced at mines by blasting, diesel equipment, and on-site locomotives. The expected decrease in NO_x emissions from diesel equipment engines due to new federal emission standards was taken into account in estimating 2015 incremental emissions.

SO_2 emissions originate from blasting, diesel equipment, and locomotives at each mine. Incremental emissions were calculated from projected increases in fuel use, based on data in recent mine analyses for fuel use per unit of coal production.

Particulate matter is generated at mines as fugitive dust (PM_{10}), and as engine emissions (a combination of $PM_{2.5}$, EC, and

OC). Fugitive PM_{10} emissions per unit of coal production were calculated from recent data for each mine and used to estimate incremental emissions for 2015 production. Incremental emissions of PM_{10}, EC, and OC from engines were calculated from projected fuel use, using the proportions of each particulate component in diesel exhaust as given by EPA's source composition library.

- Coal transportation locomotive emissions. Emissions of NO_x, SO_2, and particulate matter (EC, OC, and PM_{10}) from coal train operations were calculated using EPA emission factors, locomotive fuel use, and the reasonably expected coal production for 2015. The proposed DM&E Railroad line was included in the analysis, using a potential route and number of trains suggested by DM&E. Fuel use and the fraction of total traffic on each of the existing BN and UP rail routes were provided by the railroads. Emissions assumptions and calculations were provided to BN, UP, and DM&E representatives for review prior to use for modeling. EPA's Tier I and Tier II emission standards for new and rebuilt locomotives were taken into account in calculating year 2015 emissions by use of EPA's projected fleet average emission factors for that year.

- Wyodak CBM sources. Emissions for the CBM development will originate from compressor engines (NO_x), vehicle tailpipe emissions (NO_x), road dust from vehicle traffic (PM_{10}), and fugitive dust from disturbed areas (PM_{10}). Total emissions from all of these sources were taken from the Wyodak CBM DEIS analysis (BLM 1999a).

Total emissions from all sources and operations are shown in Table 4-7. These emissions were modeled as point and area sources, as appropriate, using the CALMET/CALPUFF modeling system, to estimate air quality impacts at the Class I and sensitive Class II areas shown on Figure 4-3.

Cumulative Air Quality Impacts

Based on the emission increase inventories for all regional sources, maximum 3-hour, 24-hour, and annual SO_2 impacts, 24-hour and annual PM_{10} impacts, and annual NO_2 impacts were modeled and compared to the PSD Class I increments at the Class I areas and to the NAAQS at each sensitive Class II area. It is important to note that this is not a formal PSD increment analysis, and the references to PSD increments and NAAQS are intended only as a basis for comparison. The comparison does not constitute an air quality regulatory determination. Air quality standards are most stringent at Class I areas (National Parks and large designated wildernesses) to afford the most protection for these

Table 4-7. Cumulative Pollutant Emissions for Far-Range Air Quality/AQRV Analysis.

	Emissions after 1995 (tons/year)					Percent of Total				
Source	**NO_x**	**SO_2**	**EC**	**OC**	**PM_{10}**	**NO_x**	**SO_2**	**EC**	**OC**	**PM_{10}**
Wyodak CBM Sources										
Proposed Compressors	2,806					13.9	0.0	0.0	0.0	0.0
Road Dust from Vehicle Traffic					11,224	0.0	0.0	0.0	0.0	64.2
Fugitive Dust from Disturbed Areas					956	0.0	0.0	0.0	0.0	5.5
Project Vehicle Exhaust	18					0.1	0.0	0.0	0.0	0.0
Other Sources										
Other Point Sources	7,662	5,032			917	37.9	76.0	0.0	0.0	5.2
Coal Mines Incremental increase (NO_x from blasting, trains, vehicles)	2,475					12.2	0.0	0.0	0.0	0.0
Coal Mines Incremental increase of fugitive dust					4,234	0.0	0.0	0.0	0.0	24.2
Coal Mines Incremental increase from mining vehicles		698	193	73	86	0.0	10.6	55.0	54.5	0.5
Coal Trains Incremental increase	7,262	888	158	61	70	35.9	13.4	45.0	45.5	0.4
Total	20,223	6,618	351	134	17,487	100	100	100	100	100

pristine areas. The results of the air quality analysis for each area are provided in Table 4-8, which demonstrates that maximum projected cumulative impacts are much smaller than regulatory standards and increments.

Visibility Impacts

Visibility impacts were calculated based on cumulative emissions impacts (modeled concentrations of nitrate, sulfate, carbon, and other particulate matter) within the CALPUFF modeling domain. Extinction coefficients were computed and their effect on visibility assessed by comparison to background extinction coefficients corresponding to the mean of the cleanest 20 percent IMPROVE (Interagency Monitoring of Protected Environments) visibility data from Badlands National Park and the Bridger Wilderness. Seasonal average relative humidity values were used for the comparison.

Results of the visibility analysis are shown in Table 4-9. Potential visibility reductions greater than the threshold values of 0.5 and 1.0 deciviews are indicated for all Class I

Table 4-8. Results of Air Quality Impact Analysis (µg/m³).

Area	**Annual NO_2**	**24-hr PM_{10}**	**Annual PM_{10}**	**3-hr SO_2**	**24-hr SO_2**	**Annual SO_2**
CUMULATIVE IMPACTS						
Northern Cheyenne Reservation, MT	0.03	0.58	0.02	1.60	0.56	0.02
Badlands National Park, SD	1.26	0.65	0.10	3.61	1.20	0.21
Wind Cave National Park, SD	0.16	0.62	0.06	2.17	0.84	0.08
Class I PSD Increment	**2.5**	**4**	**8**	**25**	**5**	**2**
Black Elk Wilderness, SD	0.09	1.04	0.05	2.48	0.79	0.07
Jewel Cave National Monument, SD	0.13	0.76	0.08	3.92	0.87	0.10
Mt. Rushmore National Monument, SD	0.08	1.01	0.05	1.93	0.55	0.06
Cloud Peak Wilderness, WY	0.01	0.90	0.04	1.08	0.32	0.01
Devils Tower National Monument, WY	0.13	0.80	0.16	2.84	0.50	0.07
National Ambient Air Quality Standard	**100**	**150**	**50**	**1300**	**365**	**80**

Table 4-9. Predicted Annual Days of Visibility Reductions at Class I and Class II Sensitive Areas from Cumulative Sources.

Location	**Type of Area**	**Number of Days Deciview Change >0.5**	**Number of Days Deciview Change >1.0**
Northern Cheyenne Reservation	Class I	18	8
Badlands National Park	Class I	173	70
Wind Cave National Park	Class I	94	45
Black Elk Wilderness	Class II	66	28
Jewel Cave National Monument	Class II	72	32
Mt. Rushmore National Monument	Class II	58	22
Cloud Peak Wilderness	Class II	15	4
Devils Tower National Monument	Class II	70	28

Note: The Northern Cheyenne Reservation is a redesignated Class I area and is not addressed by existing visibility regulations which apply to the federally mandated Badlands and Wind Cave Class I areas.

and sensitive Class II areas. The number of days with an indicated potential change of one deciview or more ranges from four days in the Cloud Peak Wilderness to 70 days in Badlands National Park. It should be recognized that the analysis results reflect potential impacts at any one or more receptors in each area (not at all receptors), and that the indicated change is relative to the 20 percent of best visibility days in each area. On many of the days for which model-predicted impacts occur, natural atmospheric conditions and/or background air quality levels would result in lower background visibility.

The model predicts that Badlands National Park would experience the most significant visibility impacts in 2015. The indicated impacts in Badlands National Park are strongly influenced by the close proximity of the modeled DM&E rail route. The modeled route is only one of a number of potential routes, and may not be representative of the actual route to be selected, nor is the modeled number of daily trains necessarily realistic of 2015 DM&E traffic. The results of the air quality modeling update that was prepared for the DM&E Railroad Powder River Basin Expansion Project have just been released in the draft EIS for that project. The results of that air quality analysis will be included in the North Jacobs Ranch Final EIS. The Badlands National Park results in Table 4-9 reflect data for those areas of the Park more than 20 km (12 mi) from the modeled rail route. The CALPUFF modeling system in the version applied in the present analysis is not appropriate for definition of impacts at shorter distances from linear sources such as railroads.

AQRV Impact (Acid Deposition)

In addition to evaluating potential impacts to visibility in Class I and sensitive Class II areas, an assessment of potential impacts to other AQRVs in these areas was performed. The AQRVs of concern for the Class I and sensitive Class II areas include soil, water, flora, and fauna. For impacts to AQRVs, other than visibility, acid deposition of nitrates and sulfates is of primary interest due to its effects on lake acidification, as well as possibly affecting flora and fauna.

The cumulative acid deposition analysis evaluated potential impacts to AQRVs by computing the amount of nitrogen and sulfur that would be deposited on land masses within the Class I and II areas. Additionally, the potential effects of acid deposition on Florence Lake (a sensitive lake located within Cloud Peak Wilderness, Wyoming) were also evaluated at the request of the FS. Nitrogen would originate from wet and dry deposition of nitrates and nitric acid, as well as dry deposition of NO_x. Sulfur would originate from wet and dry deposition of sulfates and SO_2.

To evaluate potential impacts to AQRVs, the wet and dry deposition of the nitrogen and sulfur- containing chemicals were computed using the CALPUFF model. Annual fluxes (mass per unit area) calculated for the

Class I and sensitive Class II areas were compared to the limits of acceptable change (2.7 to 4.5 lb/acre/year) for evaluating effects on soil, flora, and fauna. The acid deposition calculations used in this analysis followed the procedures outlined in the IWAQM Phase 2 Report (USEPA 1998) and FS guidance.

To evaluate the impacts to aquatic systems (Florence Lake) from acid deposition, the loss of acidification neutralization capacity (ANC), in micro-equivalents per liter (μeq/L), was computed using FS methods (USFS 1987). Since the baseline ANC at Florence Lake is 37.6 μeq/L (USDA FS 1999), the limit of acceptable change in the ANC is 10 percent.

The results of the AQRV analysis for effects from acid deposition are summarized in Table 4-10. The maximum annual deposition fluxes of nitrogen and sulfur due to cumulative emissions are shown for each Class I and II area. As the data show, the highest nitrogen deposition would be 0.24 lb/acre/year, a value that is only nine percent of the lower limit of acceptable change.

The ANC calculation for Florence Lake showed that the expected change in ANC due to cumulative acid deposition impacts would be 0.07 percent, a value much lower than the limit of acceptable change (10 percent).

Discussion

The cumulative air quality impact analysis presented here indicates that impacts in Class I and sensitive Class II areas, based on reasonably expected pollutant emission increases through the year 2015, will be quite small with the exception of impacts on visibility. The model results suggest that visibility impacts may exceed Limits of Acceptable Change (LACs) on some days in all areas evaluated. It should be noted that the LACs for visibility impacts, as well as those for other AQRVs, are not regulatory limits, but represent federal land manager policies for evaluating impacts.

Table 4-10. Predicted Levels of Acid Deposition from Cumulative Sources (lb/acre/year).

Area	Significance Level	Total Nitrogen Deposition	Total Sulfur Deposition
Northern Cheyenne Reservation	2.7 - 4.5	0.067	0.011
Badlands National Park	2.7 - 4.5	0.238	0.075
Wind Cave National Park	2.7 - 4.5	0.066	0.061
Black Elk Wilderness	2.7 - 4.5	0.047	0.059
Jewel Cave National Monument	2.7 - 4.5	0.051	0.076
Mt. Rushmore National Monument	2.7 - 4.5	0.030	0.050
Cloud Peak Wilderness	2.7 - 4.5	0.004	0.006
Devils Tower National Monument	2.7 - 4.5	0.044	0.055

The model-predicted numbers of days of visibility impacts should be interpreted only as an indication of possible impacts. There are many uncertainties involved in air quality model projections, particularly for long-range transport modeling over large areas with widely varying terrain and land surface characteristics. The CALPUFF modeling system is relatively new and its calculation algorithms and methods of application are still evolving. Results are subject to wide variability with the quality and quantity of input meteorological data, the accuracy of emission estimates, the form of representation of different types of sources, chemical reaction and particle size assumptions, and other factors.

Some of the comments received on the CALPUFF cumulative analysis for the Wyodak CBM Project DEIS were considered and addressed in the present analysis, primarily through:

- updated evaluation of railroad and coal mine emissions
- addition of a potential DM&E railroad route
- distribution of future coal train traffic based on current distribution and DM&E projections
- addition of carbon particles as specific components of PM_{10}
- addition of SO_2 emissions from diesel engines
- simulation of coal train emissions by area sources rather than volume sources.

The changes and refinements used in this analysis were reviewed by a group of industry and agency representatives which included members of the interagency committee that developed the protocol for the Wyodak CBM Project DEIS, as well as Kennecott and DM&E Railroad. The Wyodak CBM Project DEIS interagency committee included representatives from the BLM, EPA, NPS, USFS, and the State of Wyoming.

There are additional refinements and/or improvements in model application that would lead to a better definition of potential future impacts. These include utilization of recent model refinements, incorporation of more sources of regional meteorological data, further refinement of emission estimates, and a better characterization of source parameters and geometries. In addition, further research is needed into the accuracy and appropriate interpretation of model results for regional haze. These improvements were beyond the scope of the present analysis but will be addressed in future regional impact analyses.

It should be noted that model-predicted impacts, especially in Badlands National Park, are affected by proximity to the modeled route of the DM&E railroad. The DM&E route and traffic volumes were provided as examples of a possible future scenario. Potential cumulative air

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quality impacts are modeled for several alternate proposed routes in the recently released draft EIS for the DM&E Powder River Basin expansion project.

4.5.5 Water Resources

Surface Water

Streamflows may be reduced during surface coal mining because SMCRA and Wyoming state regulations require capture and treatment of all runoff from disturbed areas in sedimentation ponds before it is allowed to flow off the mine permit areas. Also, the surface coal mine pits in the PRB are large, and these pits, together with ponds and diversions built to keep water out of the pits, can intercept the runoff from significant drainage areas.

Changes in drainage patterns and surface disturbance are decreasing and will continue to decrease flows in most of the ephemeral and intermittent drainages exiting at the mine sites. Development of CBM resources in the area west of the mines could potentially increase surface flow in some drainages. Currently, there is methane production occurring in the general analysis area. (CBM development was not considered in the CHIA (Martin et al. 1988)). The Gillette South CBM Project EIS (BLM 1997) estimates that an average surface discharge of 20 gpm from each of the 423 wells considered in that analysis would result in an increase in flow of 0.5 percent to 2.4 percent of the 2-year, 24-hour flood flows (per square mile) if all of the wells discharge into the same drainage basin. The amount of CBM produced water that ultimately reaches the major channels is reduced by evaporation, infiltration into the ground, and surface landowners, who sometimes divert the produced water into reservoirs for livestock use because it is of relatively good quality. The Wyodak CBM DEIS and FEIS (BLM 1999a, 1999c) evaluate impacts of CBM production within a much larger project area, extending from over 30 miles north of Gillette to over 60 miles south of Gillette. The project area would extend westward from the PRB coal mine areas for a distance of 18 to 36 miles. The Wyodak CBM project area includes the Gillette South project area. The Wyodak CBM project considers 3,000 to 5,000 CBM wells that would each generate 12 gpm of water. This water would be discharged at an estimated 500 to 1,000 different locations over a period of 10 to 20 years. These water discharges would double the annual yield from the Upper Cheyenne drainages, in which the southern mine cluster, including the Jacobs Ranch Mine, is located. These CBM water discharges would be constant, as opposed to naturally occurring flows which fluctuate widely on a seasonal and annual basis. Most streams in the area are naturally dry throughout most of each year.

The USGS has predicted that, after reclamation, major streams in the PRB will exhibit increased runoff ranging from 0.4 percent in the Cheyenne River to 4.3 percent in Coal Creek due to cumulative disturbance as a result of existing surface coal mining (Martin et al. 1988). This is based on the assumption that unit runoff rates will be increased after reclamation due to soil compaction, and the percentage changes in runoff are based on permitted mine acreages in 1981. The additional leases since that time have increased the permitted acreage by about 40 percent and would, under the same assumptions, increase the USGS's estimates of runoff increase by the same incremental amount. This minor increase in runoff is small compared to seasonal and annual variability of runoff in the PRB.

Drainage from all five southern mines combines where Black Thunder Creek enters the Cheyenne River. The drainage area of the Cheyenne River at this point is approximately 2,430 mi^2. The entire area of disturbance from these five mines as currently permitted would impact approximately two percent of the drainage basin of the Cheyenne River, and this disturbance would occur over about 50 years. Proposed LBA's and recently issued leases would raise this disturbance acreage to roughly four percent of the Cheyenne River drainage basin at Black Thunder Creek.

Sediment concentrations should not increase significantly in area streams even with the addition of mining the pending and recently issued LBA tracts because, as discussed in Section 4.1.5, state and federal regulations require that all surface runoff from mined lands pass through sedimentation ponds. The potential for cumulative adverse impacts to the Cheyenne River drainage is also minimal because it is typically dry for a substantial portion of the year.

The CBM discharges could result in erosion and degradation of small drainages, which could affect water quality and channel hydraulic characteristics. From a surface water standpoint, the increased flows due to CBM discharges and the reduced flows due to surface coal mining will tend to offset each other. However, conflicts could also result. The CBM development takes place upstream from the mines. Provisions the mines have taken to prevent water from entering the pits (e.g., storage ponds or diversions) could be adversely affected by having to deal with flows that were not included in designs or that change conditions for future designs.

Groundwater

As a result of statutory requirements and concerns, several studies and a number of modeling analyses have been conducted to help predict the impacts of surface coal mining on groundwater resources in the Wyoming portion of the PRB. Some of these studies and modeling analyses are discussed below.

In 1987, the USGS, in cooperation with the WDEQ and OSM, conducted a study of the hydrology of the eastern PRB. The resulting description of the cumulative hydrologic effects of all current and anticipated surface coal mining (as of

1987) was published in 1988 in the USGS Water-Resources Investigation Report entitled "*Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming*", also known as the "CHIA" (Martin, et al. 1988). This report evaluates the potential cumulative groundwater impacts of surface coal mining in the area and is incorporated by reference into this EIS. The CHIA analysis included the proposed mining of all the 1987 leases at all of the existing mines in the southern mine group. It did not evaluate potential groundwater impacts related to additional coal leasing in this area and it did not consider the potential for overlapping groundwater impacts from coal mining and CBM development.

Each mine must assess the probable hydrologic consequences of mining as part of the mine permitting process. The WDEQ/LQD must evaluate the cumulative hydrologic impacts associated with each proposed mining operation before approving the mining and reclamation plan for each mine, and they must find that the cumulative hydrologic impacts of all anticipated mining would not cause material damage to the hydrologic balance outside of the permit area for each mine. As a result of these requirements, each existing approved mining permit includes an analysis of the hydrologic impacts of the surface coal mining proposed at that mine. If revisions to mining and reclamation permits are proposed, then the potential cumulative impacts of the revisions must also be evaluated. If the North Jacobs Ranch LBA Tract is leased to the applicant, the existing mining and reclamation permit for the Jacobs Ranch Mine must be revised and approved before the tract can be mined.

Additional groundwater impact analyses have also been conducted to evaluate the potential cumulative impacts of coal mining and CBM development. One example of these analyses is the report entitled A Study of Techniques to Assess Surface and Groundwater Impacts Associated with Coal Bed Methane and Surface Coal Mining, Little Thunder Creek Drainage, Wyoming (Wyoming Water Resources Center 1997). This study was prepared as part of a cooperative agreement involving WDEQ/LQD, the Wyoming State Engineer's Office, the WSGS, BLM, OSM and the University of Wyoming. The Wyodak CBM Project Draft EIS (BLM 1999a) presented the results of a modeling analysis of the potential cumulative impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers as a result of coal mining and CBM development. As a result of comments received on this modeling analysis, it was revised and the revised results were included in the Wyodak CBM Project Final EIS (BLM 1999c), which was distributed to the public on October 1, 1999. The technical report for both these modeling analyses is available for public review at the BLM office in Buffalo, Wyoming (Applied Hydrology Associates, Inc. 1999). The results of these previously prepared analyses are incorporated by reference into this EIS. These modeling analyses will be updated for the CBM EIS.

Another source of data on the impacts of surface coal mining on groundwater is the monitoring that is required by WDEQ/LQD and administered by the mining operators. Each mine is required to monitor groundwater levels and quality in the coal and in the shallower aquifers in the area surrounding their operations. Monitoring wells are also required to record water levels and water quality in reclaimed areas.

The coal mine groundwater monitoring data is published each year by GAGMO, a voluntary group formed in 1980. Members of GAGMO include most of the companies with operating or proposed mines in the Wyoming PRB, WDEQ, the Wyoming SEO, BLM, USGS, and OSM. GAGMO contracts with an independent firm each year to publish the annual monitoring results. In 1991, GAGMO published a report summarizing the water monitoring data collected from 1980 to 1990 in the Wyoming PRB (Hydro-Engineering 1991b). In 1996, they published a report summarizing the data collected from 1980 to 1995 (Hydro-Engineering 1996a).

The southern group of mines uses about 1,736 ac-ft of water per year for drinking, sanitation, washing equipment, and dust control. This water comes from aquifers below the coal, from seepage into the mine pits, and from sediment- and flood-control impoundments. The five southern mines pump an estimated 1,400 ac-ft per year from the pits and dewatering wells.

Assessment of cumulative groundwater impacts in this EIS is based on impact predictions made by JRCC for mine-related drawdown at the Jacobs Ranch Mine and extrapolating those drawdowns to consider mining of the North Jacobs Ranch LBA Tract, along with previous drawdown predictions made within the southern mine group that includes the Jacobs Ranch Mine. Figure 4-4 depicts the predicted extent of the 5-ft drawdown contour within the coal aquifer from the various mining scenarios. The extent of the 5-ft drawdown contour is used by WDEQ/LQD to assess the cumulative extent of impact to the groundwater system caused by mining operations. In Figure 4-4, these predictions are compared to the predictions in the CHIA and monitoring information gathered since publication of the CHIA. Figure 4-4 shows only the predicted drawdowns in the coal aquifer due to mining because of the limited extent of the saturated sand aquifers in the Wasatch Formation overburden in the southern group of mines.

The major groundwater issues related to surface coal mining that have been identified by scoping are:

- the effect of the removal of the coal aquifer and any overburden aquifers within the mine area and replacement of these aquifers with spoil material;

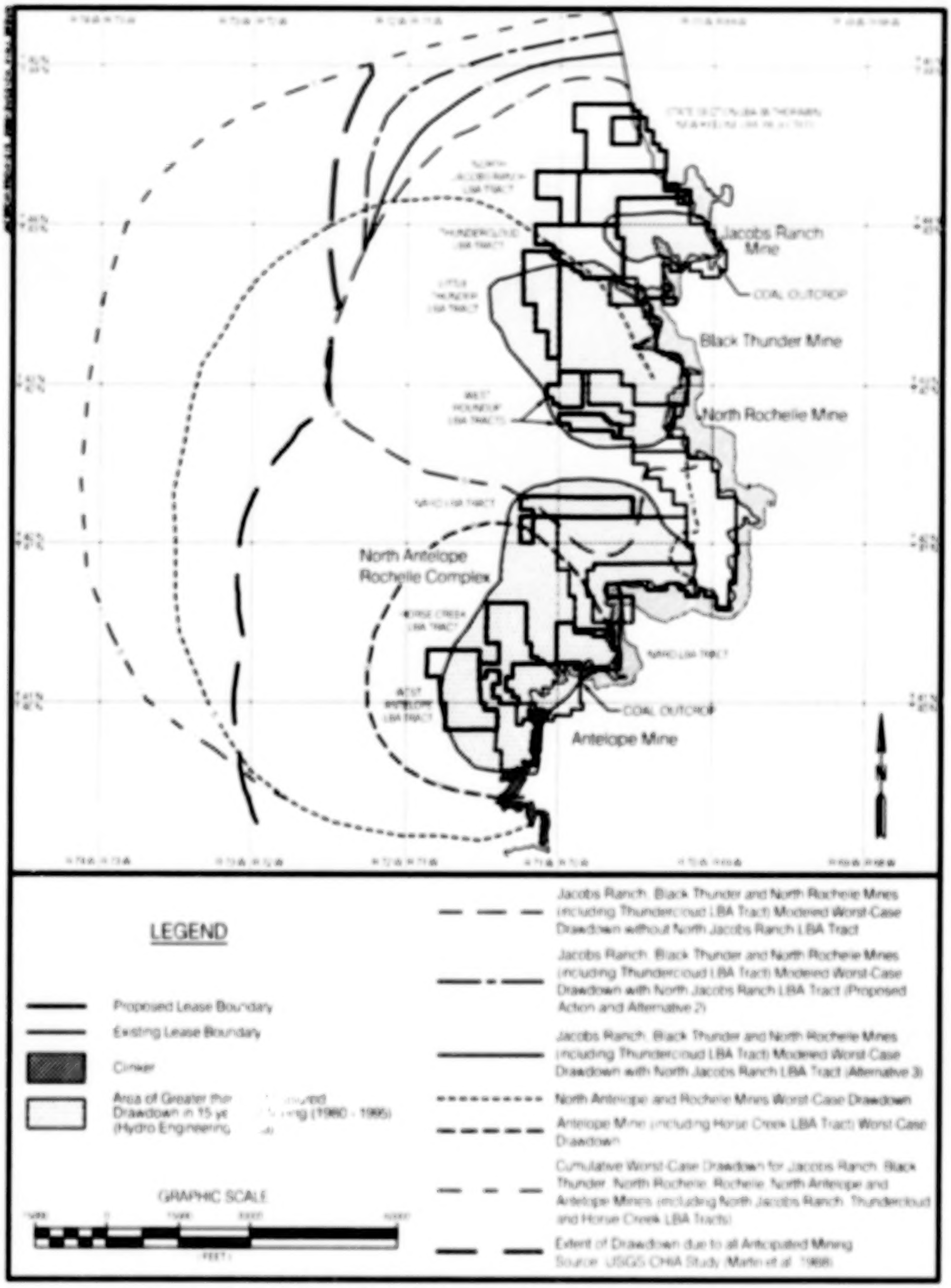
NORTH JACOBS RANCH LBA TRACT
THUNDERCLOUD LBA TRACT
Jacobs Ranch Mine
COAL OUTCROP
LITTLE THUNDER LBA TRACT
Black Thunder Mine
WEST ROUNDUP LBA TRACTS
North Rochelle Mine
NARO LBA TRACT
North Antelope Rochelle Complex
HORSE CREEK LBA TRACT
NARO LBA TRACT
WEST ANTELOPE LBA TRACT
COAL OUTCROP
Antelope Mine
N
LEGEND
Proposed Lease Boundary
Existing Lease Boundary
Clinker
Area of Greater than ... Drawdown in 15 ye... (1980 - 1995) (Hydro Engineering ...)
GRAPHIC SCALE
(FEET)
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown without North Jacobs Ranch LBA Tract
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown with North Jacobs Ranch LBA Tract (Proposed Action and Alternative 2)
Jacobs Ranch, Black Thunder and North Rochelle Mines (including Thundercloud LBA Tract) Modeled Worst-Case Drawdown with North Jacobs Ranch LBA Tract (Alternative 3)
North Antelope and Rochelle Mines Worst-Case Drawdown
Antelope Mine (including Horse Creek LBA Tract) Worst Case Drawdown
Cumulative Worst-Case Drawdown for Jacobs Ranch, Black Thunder, North Rochelle, Rochelle, North Antelope and Antelope Mines (including North Jacobs Ranch, Thundercloud and Horse Creek LBA Tracts)
Extent of Drawdown due to all Anticipated Mining Source: USGS CHIA Study (Martin et al. 1988)

Figure 4-4. Modeled and Extrapolated Worst-Case Coal Aquifer Drawdown Scenarios Showing Extent of Actual 15-Year Drawdowns and USGS Predicted Cumulative Drawdowns.

- the extent of the temporary lowering of static water levels in the aquifers around the mine due to dewatering associated with removal of these aquifers within the mine boundaries;

- the effects of the use of water from the subcoal Fort Union Formation by the mines;

- changes in water quality as a result of mining; and

- potential overlapping drawdown in the coal due to proximity of coal mining and CBM development.

The impacts of large scale surface coal mining on a cumulative basis for each of these issues are discussed in the following paragraphs.

The effects of replacing the coal aquifer and overburden with a spoils aquifer is the first major groundwater concern. The following discussion of recharge, movement, and discharge of water in the spoil aquifer is excerpted from the CHIA (Martin et al. 1988:24):

> Postmining recharge, movement and discharge of groundwater in the Wasatch aquifer and Wyodak coal aquifer will probably not be substantially different from premining conditions. Recharge rates and mechanisms will not change substantially. Hydraulic conductivity of the spoil aquifer will be approximately the same as in the Wyodak coal aquifer allowing groundwater to move from recharge areas where clinker is present east of mine areas through the spoil aquifer to the undisturbed Wasatch aquifer and Wyodak coal aquifer to the west.

GAGMO data from 1990 to 1999 verify that recharge has occurred and is continuing in the backfill (Hydro-Engineering 1991a, 1992, 1993, 1994, 1995, 1996b, 1997, 1998, 1999). The water monitoring summary reports prepared each year by GAGMO list current water levels in the monitoring wells completed in the backfill and compare them with the 1980 water levels, as estimated from the 1980 coal water-level contour maps. In the 1991 GAGMO 10-year report, some recharge had occurred in 88 percent of the 51 backfill wells reported for that year. In the 1999 GAGMO report, 89 percent of the 64 backfill wells measured contained water.

Coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by mining.

The cumulative size of the backfill area in the PRB and the duration of mining activity would be increased by mining of the recently issued leases and the currently proposed LBA Tract. However, since reclamation is occurring in mined-out areas and the monitoring data demonstrate that recharge of the backfill is occurring, it is not anticipated that additional significant impacts would occur as a result of any of the pending leasing actions. As previously discussed, through February 19, 2000 more than sixty percent of the area disturbed at the Jacobs Ranch Mine had been reclaimed, and backfill monitoring wells indicate that recharge is occurring in the backfill at the Jacobs Ranch Mine.

Clinker, also called scoria, the baked and fused rock formed by prehistoric burning of the Wyodak-Anderson coal seam, occurs all along the coal outcrop area (Figure 4-4) and is believed to be the major recharge source for the spoil aquifer, just as it is for the coal. However, not all clinker is saturated. Some clinker is mined for road-surfacing material, but saturated clinker is not generally mined since abundant clinker exists above the water table and does not present the mining problems that would result from mining saturated clinker. Therefore, the major recharge source for the spoil aquifer is not being disturbed by current mining. Clinker does not occur in significant amounts on the LBA Tract being considered in this EIS.

The second major groundwater issue is the extent of water level drawdown in the coal and shallower aquifers in the area surrounding the mines. Most of the monitoring wells included in the GAGMO 15-year report (542 wells out of 600 total) are completed in the coal beds, in the overlying sediments, or in sand channels or interburden between the coal beds. The changes in water levels in the coal seams after 15 years of monitoring are shown on Figure 4-4, which was adapted from the 1996 GAGMO 15-year report (Hydro Engineering 1996a). This map shows the area where actual drawdown in the coal seam has been greater than 5 ft in 15 years, in comparison with the predicted worst-case 5-ft drawdown derived from groundwater modeling done by the mines. WDEQ/LQD policy is to have the mining companies determine the extent of the 5-ft drawdown contour as a method of determining off-site impacts from the various mining operations.

Figure 4-4 indicates that the drawdowns observed in 15 years of mining are still well within the total cumulative drawdown predicted in the CHIA. Adding the predictions for the North Jacobs Ranch, Horse Creek, and Thundercloud LBA Tracts to existing drawdown predictions prepared for the Jacobs Ranch, Black Thunder, North Rochelle, Rochelle, North Antelope and Antelope Mines extends the predicted cumulative extent of the 5-ft drawdown about 9.5 miles past the cumulative drawdown prediction in the 1988 CHIA.

The CHIA predicted the approximate area of 5 ft or more water level decline in the Wyodak coal aquifer which would result from "all anticipated coal mining". "All anticipated coal mining" at that time included 16 surface coal mines operating at the time the report was prepared and six additional mines proposed at that time. All of the currently producing mines, including the Jacobs Ranch Mine, were considered in the CHIA analysis (Martin et al. 1988). The study predicted that water supply wells completed in the coal may be affected as far away as eight miles from mine pits, although the effects at that distance were predicted to be minimal.

As drawdowns propagate to the west, available drawdown in the coal aquifer increases. Available drawdown is defined as the elevation difference between the potentiometric surface (elevation to which water will rise in a well bore) and the bottom of the aquifer. Proceeding west, the coal depth increases faster than the potentiometric surface declines, so available drawdown in the coal increases. Since the depth to coal increases, most stock and domestic wells are completed in units above the coal. Consequently, with the exception of methane wells, few wells are completed in the coal in the areas west of the mines. Those wells completed in the coal have considerable available drawdown, so adverse impacts to wells outside the immediate mine area are unlikely.

Wells in the Wasatch Formation were predicted to be impacted by drawdown only if they were within 2,000 ft of a mine pit (Martin et al. 1988). Drawdowns occur farther from the mine pits in the coal than in the shallower aquifers because the coal is a confined aquifer that is areally extensive. The area in which the shallower aquifers (Wasatch Formation, alluvium, and clinker) experience a 5-ft drawdown would be much smaller than the area of drawdown in the coal because the shallower aquifers are generally discontinuous, of limited areal extent, and may be confined or unconfined.

Since the actual 1995 drawdown lies within the cumulative drawdown predicted by the CHIA study, the cumulative impacts to water wells have not reached the maximum levels predicted in that report. Of the 1,200 water supply wells within the maximum impact area defined in the CHIA study, about 580 are completed in Wasatch aquifers, about 100 in the Wyodak coal aquifer, and about 280 in strata below the coal. There are no completion data available for the remainder of these wells (about 240).

The additional groundwater impacts that would be expected as a result of extending mining into the LBA's issued or proposed to date would be to extend the drawdown into areas surrounding the proposed new leases. The predicted cumulative effects of mining the LBA Tract are depicted on Figure 4-4. Currently, the actual drawdown in the coal aquifer in the vicinity of Black Thunder and Jacobs Ranch mines is expressed in two separate cones of depression; drawdowns in the vicinity of the Antelope and North Antelope/Rochelle mines have coalesced. These cumulative drawdowns would be increased by mining the North Jacobs Ranch LBA Tract.

If a maintenance lease is issued for the North Jacobs Ranch LBA Tract, prior to amending the tract into an existing WDEQ mine permit, the lessee would be required to conduct more detailed groundwater modeling to predict the extent of drawdown in the coal and overburden aquifers caused by mining the LBA Tract. WDEQ/LQD will then use the drawdown predictions to update the CHIA for this portion of the PRB. The applicant has installed monitoring wells which would be used to confirm or refute drawdowns predicted by modeling. This modeling would be required as part of the WDEQ mine permitting procedure discussed in Section 1.2.

Withdrawal of water for the ENCOAL facility would lower water levels in the scoria aquifer to the east of the North Rochelle Mine if the rate of withdrawal exceeds recharge (currently unknown). As discussed above, the scoria provides the primary source of recharge to the Wyodak coal aquifer. As mining at the North Rochelle Mine continues, the coal will be removed and replaced with spoil, which would be expected to have the same conductivity as the Wyodak coal aquifer according to Martin, et al. (1988 p. 24). The primary impact due to lowering water levels in the scoria would be a potential delay in the recovery of water levels in the North Rochelle Mine backfill, as the rate at which the backfill would receive recharge from the scoria would be related to the scoria water levels. Based on the size of the scoria aquifer supplying ENCOAL and the amount of water to be withdrawn from it, complete recovery of the scoria water levels could take up to 100 years, slowing recovery of North Rochelle Mine spoil water levels for an equal duration. Since predictions for recovery of water levels in the spoils range from tens to thousands of years, the additional delay in recovery caused by the ENCOAL water supply wells is within the range of predictions.

The proposed Two Elk project, if constructed, would also add to cumulative impacts. Currently, water demands for the Two Elk project have not been finalized. The likely source of supply for the Two Elk project will be the Lance-Fox Hills Aquifer.

Potential water-level decline in the subcoal Fort Union Formation is the third major groundwater issue. According to the Wyoming State Engineer's records as of July 1999, 14 mines hold permits for 42 wells between 400 ft and 10,000 ft deep. The zone of completion of these wells was not specified, and not all of the wells were producing (for example, three of the permits were held by an inactive mine, and one of the wells permitted by the Black Thunder Mine has not been used since 1984).

Water level declines in the Tullock Aquifer have been documented in the Gillette area. According to Crist (1991), these declines are most likely attributable to pumpage for municipal use by Gillette and for use at subdivisions and trailer parks in and near the city of Gillette. Most of the water-level declines in the subcoal Fort Union wells occur within one mile of the pumped wells (Crist 1991; Martin et al. 1988). The mine facilities in the PRB are separated by a distance of one mile or more, so little interference between mine supply wells would be expected.

In response to concerns voiced by regulatory personnel, several mines have conducted impact studies of the subcoal Fort Union Formation. The OSM commissioned a cumulative impact study of the subcoal Fort Union Formation to study the effects of mine facility wells on this aquifer unit (OSM 1984). Conclusions from all these studies are similar and may be summarized as follows:

- Because of the discontinuous nature of the sands in this formation and because most large-yield wells are completed in several different sands, it is difficult to correlate completion intervals between wells.

- In the Gillette area, water levels in this aquifer are probably declining because the city of Gillette and several subdivisions are utilizing water from the formation (Crist 1991). (Note: Gillette is mixing this water with water from wells completed in the Madison Formation at this time.)

- Because large saturated thicknesses are available in this aquifer unit, generally 500 ft or more, a drawdown of 100 to 200 ft in the vicinity of a pumped well would not dewater the aquifer.

The Jacobs Ranch Mine adjacent to the North Jacobs Ranch LBA Tract has a permit from the State Engineer for five deeper Ft. Union Formation water supply wells. Extending the life of the mine with the LBA Tract would result in additional water being withdrawn from the Tullock Aquifer. The additional water withdrawal would not be expected to extend the area of water level drawdown over a significantly larger area due to the discontinuous nature of the sands in the Tullock Aquifer and the fact that drawdown and yield reach equilibrium in a well due to recharge effects.

The nearest sub-coal Fort Union well to the Jacobs Ranch Mine facilities is over 5 miles away, at the Black Thunder Mine. Due to the distance involved, these wells have not experienced interference and are not likely to in the future. The Jacobs Ranch Mine wells will be in use for roughly 8 to 13 more years if the North Jacobs Ranch LBA Tract is leased. Their annual water production would increase, though not directly in proportion to coal production, which could increase by about 30 percent if the North Jacobs Ranch Tract is leased.

According to the Wyoming SEO, the only permitted, non-mine wells drilled below 1,000 ft in a 100 mi^2 area surrounding Wright are four wells permitted by the City of Wright. As discussed above, most of the water-level declines in the subcoal Fort Union wells occur within one mile of pumped wells. The North Jacobs Ranch LBA Tract, about 7 miles east of Wright, would not contribute significantly to any cumulative impact on the water supply for that town under the action alternatives because no new wells would be required to maintain existing production.

Water requirements and sources for the proposed Two Elk project are not currently known. The State Engineer is discouraging further development of the lower Fort Union aquifers, so the most likely groundwater source for Two Elk is the Lance-Fox Hills. This will reduce the chances that Two Elk will add to cumulative hydrologic impacts of mining.

The fourth issue of concern with groundwater is the effect of mining on water quality. Specifically, what effect does mining have on the water quality in the surrounding area, and what are the potential water quality problems in the spoil aquifer following mining?

In a regional study of the cumulative impacts of coal mining, the median concentrations of dissolved solids and sulfates were found to be larger in water from spoil aquifers than in water from either the Wasatch overburden or the coal aquifer (Martin et al. 1988). This is expected because blasting and movement of the overburden materials exposes more surface area to water, increasing dissolution of soluble materials, particularly when the overburden materials were situated above the saturated zone in the premining environment. On the basis of studies done in North Dakota, it was estimated that at least one pore volume of water must leach the backfilled spoils before the dissolved solids concentration in the water would be similar to the premining dissolved solids concentration (Houghton et al. 1987). One pore volume of water is the volume of water which would be required to saturate the spoils following reclamation. The time required for one pore volume of water to pass through the spoils aquifer is greater than the time required for the postmining groundwater system to re-establish equilibrium. According to the CHIA, estimates of the time required to re-establish equilibrium range from tens to hundreds of years (Martin et al. 1988).

Chemical analyses of 336 samples collected between 1981 and 1986 from 45 wells completed in spoil aquifers at ten mines indicated that the quality of water in the spoils will, in general, meet state standards for livestock use when recharge occurs (Martin et al. 1988). The major current use of water from the aquifers being replaced by the spoils (the Wasatch and Wyodak Coal aquifers) is for livestock because these aquifers are typically high in dissolved solids in their premining state (Martin et al. 1988).

According to monitoring data published by GAGMO (Hydro-Engineering 1991a, 1991b, 1992, 1993, 1994, 1995, 1996b, 1997, 1998 and 1999), TDS values in backfill wells have ranged from 400 to 25,000 mg/L. Of the 43 backfill wells measured in 1998 and reported in the 1999 annual GAGMO report (Hydro

Engineering 1999), TDS in 70 percent were less than 5,000 mg/L, TDS in 28 percent were between 5,000 and 10,000 mg/L, and TDS in one well was above 10,000 mg/L. These data support the conclusion that water from the spoils will generally be acceptable for its current use, which is livestock watering, before and after equilibrium is established. The incremental effect on groundwater quality due to leasing and mining of the LBA Tract would be to increase the total volume of spoil and, thus, the time for equilibrium to re-establish.

The fifth area of concern is the potential for cumulative impacts to groundwater resources in the coal due to the proximity of coal mining and CBM development. The Wyodak coal is being developed for both coal and CBM in the same general area. Dewatering activities associated with reasonably foreseeable CBM development would be expected to overlap with and expand the area of groundwater drawdown in the coal aquifer in the PRB over what would occur due to coal mining alone.

Numerical groundwater flow modeling was used to predict the drawdown impacts of the Wyodak CBM Project (BLM 1999c). The modeling considered coal mining and CBM development in order to assess cumulative impacts. Modeling was done to simulate mining with and without CBM development in order to differentiate the impacts of the two types of activities.

As expected, modeling showed that the additional groundwater impacts that would result from CBM development would be additive in nature and would extend the area experiencing a loss in hydraulic head to the west of the mining area. The area between the CBM fields and the mines would be subjected to cumulative impacts of the two activities. The 15-year GAGMO report points out that there are already areas of overlapping impacts between the Marquiss and Lighthouse CBM projects and the Caballo, Belle Ayr and Cordero-Rojo mines (Hydro-Engineering 1996a).

Figure 4-5 shows the Jacobs Ranch Mine life-of-mine drawdown map (same as Figure 4-2) with the maximum modeled drawdowns from the Wyodak CBM DEIS superimposed. These modeled drawdowns are for CBM only in the upper Wyodak Coal and are for the proposed action of 3,000 CBM wells (BLM 1999a, 1999c). The groundwater modeling study done for the Wyodak CBM Draft and Final EIS's considered the impacts of coal mining and CBM development on groundwater in the coal and overlying aquifers in the area shown in Figure 1-1 using the existing coal mines and predicted CBM well locations based on discussions with CBM operators. The model was prepared under the assumption that CBM drilling would occur west of the Jacobs Ranch Mine. Figure 4-5 shows that the projected drawdown in the coal caused by mining at the Jacobs Ranch Mine would be expected to overlap with projected drawdown due to CBM

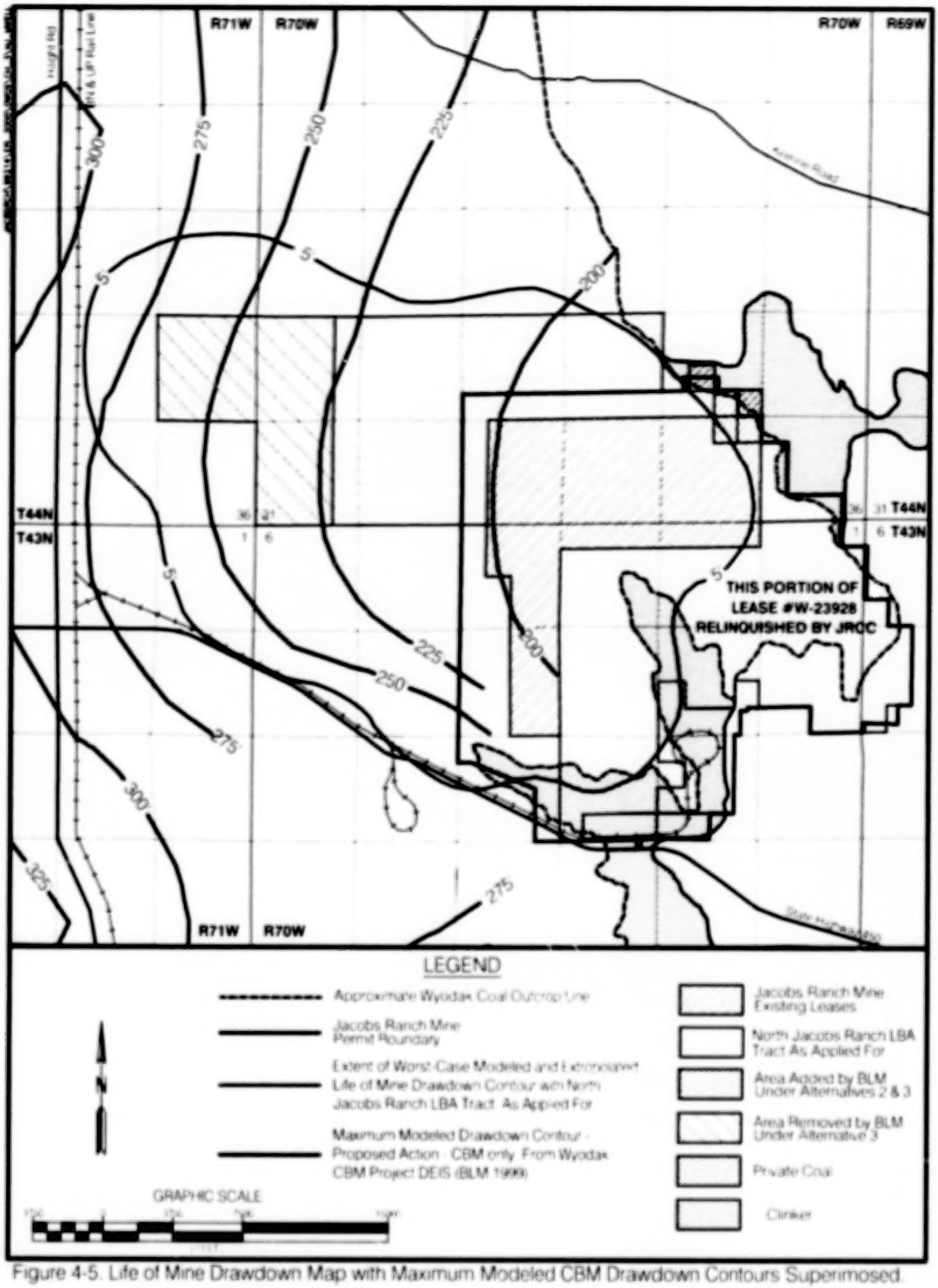
R71W
R70W
R70W
R69W
Haight Rd
BN & UP Rail Line
300
275
250
225
200
5'
Antelope Road
T44N
T43N
36
31
1
6
THIS PORTION OF LEASE #W-23928 RELINQUISHED BY JRCC
325
State Highway 450
LEGEND
Approximate Wyodak Coal Outcrop Line
Jacobs Ranch Mine Permit Boundary
Extent of Worst-Case Modeled and Extrapolated Life of Mine Drawdown Contour with North Jacobs Ranch LBA Tract As Applied For
Maximum Modeled Drawdown Contour - Proposed Action - CBM only From Wyodak CBM Project DEIS (BLM 1999)
N
GRAPHIC SCALE
750
0
750
1500
3000
FEET
Jacobs Ranch Mine Existing Leases
North Jacobs Ranch LBA Tract As Applied For
Area Added by BLM Under Alternatives 2 & 3
Area Removed by BLM Under Alternative 3
Private Coal
Clinker

Figure 4-5. Life of Mine Drawdown Map with Maximum Modeled CBM Drawdown Contours Superimosed.

production. To the north, south and west of the Jacobs Ranch Mine, the projected drawdown in the coal aquifer due to CBM production would exceed drawdown due to mining. Even within close proximity to the mine, projected drawdown due to mining would be less than projected drawdown due to CBM production. Drawdowns from CBM development would be projected to exceed drawdowns from coal mining at a distance of less than one mile from the mine.

Drawdowns in the coal caused by CBM development would be expected to reduce the need for dewatering in advance of mining, which would be beneficial for mining. Wells completed in the coal may also experience increased methane emissions in areas of significant aquifer depressurization. There would be a potential for conflicts to occur over who (coal mining or CBM operators) is responsible for replacing or repairing private wells that are adversely affected by the drawdowns; however, the number of potentially affected wells completed in the coal is not large.

As discussed previously, coal companies are required by state and federal law to mitigate any water rights that are interrupted, discontinued, or diminished by coal mining. In response to concerns about the potential impacts of CBM development on water rights, a group of CBM operators and local landowners developed a standard water well monitoring and mitigation agreement that can be used on a case-by-case basis as development proceeds. The BLM decision record for the Gillette South CBM Project EIS (BLM 1997) requires that CBM operators offer landowners this agreement as part of the federal well approval process.

BLM and industry have cooperated to develop a system of monitoring wells designed to monitor groundwater levels in the coal and in shallower aquifers in areas of CBM production. In the future, the CBM operators will be responsible for drilling and maintaining additional monitoring wells as the area of CBM development expands.

The increased dewatering or depressuring of the coal seam caused by CBM development and mining together will also increase the time required for water-level recovery to occur after the CBM and mining projects are completed.

4.5.6 Alluvial Valley Floors

No cumulative impacts to alluvial valley floors are expected to occur as a result of leasing and subsequent mining of the North Jacobs Ranch LBA Tract. Impacts to designated AVF's are generally not permitted if the AVF is determined to be significant to agriculture. AVF's that are not significant to agriculture can be disturbed during mining but they must be restored as part of the reclamation process. Impacts during mining, before the AVF is restored, would be expected to be incremental, not additive.

4.5.7 Wetlands

Wetlands are discrete features that are delineated on the basis of specific soil, vegetation, and hydrologic characteristics. Wetlands within areas of coal mining disturbance are impacted; wetlands outside the area of disturbance are generally not affected unless their drainage areas (hence, water supplies) are changed by mining. Therefore, the impacts to wetlands as a result of surface coal mining are mostly incremental, not additive as are impacts to groundwater and air quality. Increasing the area to be mined would increase the number of wetlands that would be impacted.

Jacobs Ranch Mine has been authorized to impact 81.15 acres of jurisdictional wetlands. This number would increase if the LBA Tract is leased (Section 3.8).

COE requires replacement of all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. As part of the mining and reclamation plans for each mine, COE approves the plan to restore the wetlands and the number of acres of wetlands to be restored. Replacement of functional wetlands may occur in accordance with agreements with the private landowners; no federal surface lands are included in the North Jacobs Ranch LBA Tract. During mining and before replacement of wetlands, all wetland functions would be lost. The replaced wetlands may not function in the same way as the premine wetlands did.

4.5.8 Vegetation

Most of the land that is being or would be disturbed is grassland, sagebrush shrubland or breaks grassland and is used for grazing and wildlife habitat. Rangeland is, by far, the predominant land use in the PRB, comprising 92 percent of the land use in Converse and Campbell Counties. A small amount of previously cultivated lands would be disrupted by mining. At the completion of mining, it is anticipated that all disturbed land would be reclaimed for grazing and wildlife habitat, mostly in the form of mixed native grass prairie, sagebrush shrubland and, where appropriate, bottomland grassland. Some of the minor community types, such as those occurring on breaks, would not be restored to premining conditions but may be replaced to a higher level due to use of better quality soils.

Based on annual reports prepared by mining companies and submitted to WDEQ, in any given year approximately 10,000 acres of land disturbed by mining activities at the five existing southern surface coal mines would not be reclaimed to the point of planting with permanent seed mixtures. Over the life of the five southern mines, a total of about 63,500 acres would be disturbed. This disturbed area includes all leases existing including federal, state and private coal. The currently proposed North Jacobs Ranch, NARO, Little Thunder, West Roundup, and West Antelope LBAs would add roughly another 20,000 acres. Almost all of this acreage is native rangeland and would be returned to a native rangeland state through planting of approved revegetation seed mixtures as required.

Several impacts to vegetation would occur as a result of operations at these five mines. Most of the surface disturbance would occur in two vegetation types: mixed grass prairie (25 percent) and Wyoming big sagebrush (40 percent). The big sagebrush vegetation type comprises 44 percent of the North Jacobs Ranch LBA Tract area, roughly the same percentage for the five-mine southern cluster. Upland grassland comprises 14 percent of the disturbance area of the tract. All five mines plan to restore these two types as required by law. It is estimated that it would take from 20 to 100 years for big sagebrush density to reach premining levels. The big sagebrush component provides important wildlife habitat (particularly for mule deer, pronghorn, and sage grouse). The reduction in acreage of big sagebrush vegetation type would, therefore, reduce the carrying capacity of the reclaimed lands for pronghorn and sage grouse populations. Mule deer should not be affected since they are not as abundant in this area.

Although some of the less extensive native vegetation types (e.g., graminoid/forb ephemeral drainages) would be restored during reclamation, the treated grazing lands would not. Following reclamation and release of the reclamation bond, however, privately owned surface lands would be returned to agricultural management and the areas with re-established native vegetation could again be subject to sagebrush management practices.

Community and species diversities would initially be lower on reclaimed lands. The shrub components would take the longest to be restored to premining conditions. Shrub cover and forage values would gradually increase in the years following reclamation. Over longer periods of time, species re-invasion and shrub establishment on reclaimed lands should largely restore the species and community diversity on these lands to premining levels.

Over the long term, the net effect of the cumulative mine reclamation plans may be the restoration, at least in part, of all vegetation types originally found in the area. However, the shrub component may be substantially reduced in areal extent. Shrubs are relatively unproductive for livestock but very important for wildlife. All of the vegetation types found in the cumulative analysis area, as on the LBA Tract, are fairly typical for this region of eastern Wyoming.

4.5.9 Wildlife

The direct impacts of surface coal mining on wildlife occur during mining and are therefore short-term. They include road kills by mine-related traffic, restrictions on wildlife movement created by fences, spoil piles and pits, and displacement of wildlife from active mining areas. The indirect impacts are longer term and include loss of carrying capacity and microhabitats on reclaimed land due to flatter topography, less diverse vegetative cover, and reduction in sagebrush density.

After mining and reclamation, alterations in the topography and vegetative cover, particularly the reduction in sagebrush density, would cause a decrease in carrying capacity and diversity on the LBA Tract. Sagebrush would gradually become reestablished on the reclaimed land, but the topographic changes would be permanent.

Cumulative impacts to most wildlife would increase as additional habitat is disturbed but would moderate as more land is reclaimed. Raptor and grouse breeding areas have been diminishing statewide for at least the last 30 years due, in part, to surface-disturbing activities. Coal mining and gas exploration and development have been identified as potential contributors to the decline in their breeding habitat. Therefore, surface occupancy and disturbance restrictions, as well as seasonal restriction stipulations, have been applied to operations occurring on or near these crucial areas on public lands. These restrictions have helped protect important raptor and grouse habitat on public lands, but the success of yearlong restrictions on activities near areas critical to grouse has been limited because most of the surface in the PRB is privately owned. Erection of nesting structures and planting of trees on reclaimed land will gradually replace raptor nesting and perching sites. There is little crucial habitat for waterfowl or fish on the mine sites. Small- and medium-sized animals will rapidly move back into the areas once reclamation is completed.

Numerous grazing management projects (fencing, reservoir development, spring development, well construction, vegetative treatments) have also impacted wildlife habitat in the area. The consequences of these developments have proven beneficial to some species and detrimental to others. Fencing has aided in segregation and distribution of livestock grazing, but sheep-tight woven wire fence has restricted pronghorn movement. Water developments are used by wildlife; however, without proper livestock management, many of these areas can become overgrazed. The developed reservoirs provide waterfowl, fish, and amphibian habitat. Vegetation manipulations have included the removal or reduction of native grass-shrublands and replacement with cultivated crops (mainly alfalfa/grass hay), as well as a general reduction of shrubs (mainly sagebrush) in favor of grass. These changes have increased spring and summer habitat for grazing animals, but have also reduced the important shrub component that is critical for winter range, thus reducing overwinter survival for big game and sage grouse. The reduction in sagebrush has been directly blamed for the downward trend in the sage grouse populations.

The regional EIS's (BLM 1974, 1979, 1981, and 1984) predicted significant cumulative impacts to pronghorn from existing concentrated mining and related disturbance as a result of habitat disturbance and creation of barriers to seasonal and daily movements. Significant cumulative indirect impacts were also predicted because of increased human population and access resulting in more poaching, increased vehicle/pronghorn collisions, and increased disturbance in general. Leasing of the North Jacobs Ranch LBA Tract would increase the area of habitat disturbance in the southern group of mines by approximately six percent and would enlarge the area where daily movement is restricted.

The North Jacobs Ranch LBA Tract is within the Hilight Pronghorn Herd Unit, which includes about 546,000 acres. The mining operations within the Hilight Herd Unit are the Caballo, Belle Ayr, Caballo-Rojo, Coal Creek, and Jacobs Ranch. These mines will cumulatively disturb 44,754 acres based on existing leases. If the North Jacobs Ranch LBA Tract is leased, the estimated mining disturbance within the Hilight Herd Unit would increase by up to 5,364 acres to 50,118 acres. This would represent approximately 9.2 percent of the Hilight Herd Unit area.

The North Jacobs Ranch LBA Tract is located within the Thunder Basin Mule Deer Herd Unit. The herd unit contains approximately 2.33 million acres and includes 9 permitted coal mines along Highway 59. The northern-most is Caballo and the southern-most is Antelope. Currently permitted disturbance within this 9-mine group includes approximately 76,760 acres. Addition of the recently leased Horse Creek and proposed North Jacobs Ranch LBA Tracts would increase the disturbance area by up to 8,945 acres, an increase of 11.7 percent. The recently issued Thundercloud and Powder River LBA Tracts, with a combined proposed disturbed area of as much as 8,503 acres, are also within this mule deer herd unit. Adding the North Jacobs Ranch, Horse Creek, Thundercloud and Powder River Tracts to the area to be disturbed within the Thunder Basin and Lance Creek Mule Deer Herd Units (The Horse Creek lease is within the Lance Creek Herd Unit) would increase disturbance by 17,448 acres, bringing the total disturbance up to 94,208 acres or 2.4 percent of the four million acres that encompass the two herd units.

There is little use of the LBA Tract by other big game species (elk, and white-tailed deer).

The area of active mining in the southern group of mines contains significant numbers of raptor nests. The largest concentration of nesting activity in the area is associated with the rough breaks country and areas where trees have become established. Raptor mitigation plans are included in the approved mining and reclamation plans of each mine. The raptor mitigation plan for each mine is subject to USFWS review and approval before the mining and reclamation plan is approved. Any nests that are impacted by mining operations must be relocated in accordance with these plans, after special use permits are secured from

USFWS and WGFD. The creation of artificial raptor nest sites and raptor perches may ultimately enhance raptor populations in the mined area. On the other hand, where power poles border roads, perched raptors may continue to be illegally shot and continued road kills of scavenging eagles may occur. Any influx of people into previously undisturbed land may also result in increased disturbance of nesting and fledgling raptors.

Cumulative impacts to waterfowl from already-approved mining, as well as the proposed LBA Tract, would be insignificant because most of these birds are transient and most of the ponds are ephemeral. In addition, the more permanent impoundments and reservoirs that are impacted by mining would be restored. Sedimentation ponds and wetland mitigation sites would provide areas for waterfowl during mining.

Direct habitat disturbance from already-approved mining, as well as the LBA Tract, should not significantly affect regional sage grouse populations because few vital sage grouse wintering areas or leks have been, or are planned to be, disturbed. However, noise related to the mining activity could indirectly impact sage grouse reproductive success. Sage grouse leks close to active mining could be abandoned if mining-related noise elevates the existing ambient noise levels. Surface coal mining activity is known to contribute to a drop in male sage grouse attendance at leks close to active mining, and over time this can alter the distribution of breeding grouse (Remington and Braun 1991). Because sage grouse populations throughout Wyoming have been declining over the past several years, this impact could be significant to the local population when evaluated with the cumulative impacts of all energy-related development occurring in the area.

The existing and proposed mines in the southern PRB would cumulatively cause a reduction in habitat for other mammal and bird species. Many of these species are highly mobile, have access to adjacent habitats, and possess a high reproductive potential. As a result, these species should respond quickly and invade suitable reclaimed lands as reclamation proceeds.

Cumulative impacts on fish habitat and populations would be minimal because local drainages generally have limited value due to intermittent or ephemeral flows. Some of the permanent pools along drainages support minnows and other nongame fish, and the larger impoundments and streams in the area which have fish populations would be restored following mining.

Additional discussions of cumulative impacts to wildlife from coal development and industrialization of the eastern PRB are discussed in BLM regional EIS's for the area (BLM 1974, 1979, 1981, 1984), and these documents are incorporated by reference into this EIS. The impacts predicted in these documents have generally not been exceeded.

4.5.10 Threatened, Endangered, and Candidate Species

Refer to Appendix F.

4.5.11 Land Use and Recreation

In addition to reducing livestock grazing and wildlife habitat, surface coal mining also disrupts conventional oil and gas development, releases CBM resources if they are not produced prior to mining and limits access to public lands. The potential impacts of conflicts between CBM and coal development are discussed in Section 4.1.2.

Cumulative impacts resulting from energy extraction in the PRB include a reduction of livestock grazing and subsequent revenues, a reduction in habitat for some species of wildlife (particularly pronghorn, sage grouse and mule deer), and loss of recreational access to public lands (particularly for hunters).

There are no recreation facilities, wilderness areas, etc., in the immediate vicinity of the existing southern group of mines, and the majority of the land is seldom used by the public except for dispersed recreation (e.g., hunting), off-road vehicles, and sightseeing. Hunting and other public access is generally limited inside of the mine permit areas for safety reasons. However, approximately 80 percent of this land surface is private and access is controlled by the landowner. Leasing the North Jacobs Ranch LBA Tract would not affect access to public lands because no public lands are included on the tract.

The increased human presence associated with the cumulative energy development in the PRB has likely increased levels of legal and illegal hunting. Conversely, the mines in the area have become refuges for big game animals during hunting seasons since they are often closed to hunting. Reclaimed areas are attractive forage areas for big game. As an example, reclaimed lands at the Jacobs Ranch Mine have been declared crucial elk winter habitat by WGFD (Oedekoven 1994). Energy development-related indirect impacts to wildlife have and will continue to result from human population growth. Energy development has been the primary cause of human influx into the eastern PRB. Mining the LBA Tract under the Proposed Action and Alternatives 2 and 3 will support a small increase (5 percent) in employment numbers, a thirty percent increase in production, and a 12 year increase in remaining years of production at the Jacobs Ranch Mine.

The demand for outdoor recreational activities, including hunting and fishing, has increased proportionately as population has increased. However, at the same time these demands are increasing, wildlife habitat and populations are being reduced. This conflict between decreased habitat availability and increased recreational demand has had (or may have) several impacts: demand for hunting licenses may increase to the point that a lower success in drawing particular licenses will occur; hunting and fishing, in general, may become less enjoyable due to more limited success and overcrowding; poaching may increase; the increase in people and traffic has and may continue to result in shooting of nongame species and road kills; and increased off-road activities have and will continue to result in disturbance of wildlife during sensitive wintering or reproductive periods.

Campbell County's public recreation facilities are some of the most extensively developed in the Rocky Mountain Region, and use by young, recreation-oriented residents is high. The relatively strong financial position of the county recreation program appears to assure future recreation opportunities for residents regardless of the development of the LBA Tract or any other specific mine. Converse County's recreational facilities are not as advanced, and development of the LBA Tract and the ensuing employment increase may increase demand for recreational opportunities in Converse County.

4.5.12 Cultural Resources

In most cases, treatment of eligible sites is confined to those that would be directly impacted, while those that may be indirectly impacted receive little or no consideration unless a direct mine-associated effect can be established. The higher population levels associated with coal development coupled with increased access to remote areas can result in increased vandalism both on and off mine property. Development of lands in which coal is strip-mineable (shallow overburden) may contribute to the permanent unintentional destruction of segments of the archeological record.

A majority of the known cultural resource sites in the PRB are known because of studies at existing and proposed coal mines. An average density estimate of 8.5 sites per mi^2 (640 acres) can be made based on inventories at existing mines in the area, and approximately 25 percent of these sites are typically eligible for the NRHP. Approximately 550 cultural resource sites will be impacted by already-approved mines, with an estimated 140 of these sites being eligible for nomination to the NRHP. Clearly, a number of significant sites, or sites eligible for nomination to the NRHP, have been or will be impacted by coal mining operations within the PRB. Ground disturbance, the major impact, can affect the integrity of or destroy a site. Changes in setting or context greatly impact historical properties. Mitigation measures such as stabilization, restoration, or moving of buildings may cause adverse impacts to context, in-place values, and overall integrity. Additionally, loss of sites through mitigation can constitute an adverse impact by eliminating the site from the regional database and/or affecting its future research potential.

Beneficial results or impacts can also occur from coal development. Valuable data are collected during cultural resource surveys. Data that would otherwise not be collected until some time in the future, or lost in the interim, are made available for study. Mitigation also results in the collection and preservation of data that would otherwise be lost. The data that has been and will be collected provided opportunities for regional and local archeological research projects.

4.5.13 Native American Concerns

No cumulative impacts to Native American traditional values or religious sites have been identified as a result of leasing and subsequent mining of the North Jacobs Ranch LBA Tract.

4.5.14 Paleontological Resources

Impacts to paleontological resources as a result of the already-approved cumulative energy development occurring in the PRB consist of losses of plant, invertebrate, and vertebrate fossil material for scientific research, public education (interpretive programs), and other values. Losses have and will result from the destruction, disturbance, or removal of fossil materials as a result of surface-disturbing activities, as well as unauthorized collection and vandalism. A beneficial impact of surface mining can be the exposure of fossil materials for scientific examination and collection, which might never occur except as a result of overburden removal, exposure of rock strata, and mineral excavation.

4.5.15 Visual Resources

A principal visual impact in this area is the visibility of mine pits and facility areas. People most likely to see these facilities would either be passing through the area or visiting it on mine-related business. Except for the loading facilities and the draglines, the pits and facilities are not visible from more than a few miles away. No new facilities would be required to mine the LBA Tract as an extension of the existing Jacobs Ranch Mine. Issuance of the LBA Tract would not change this impact.

After mining, the reclaimed slopes might appear somewhat smoother than premining slopes and there would be fewer gullies than at present. Even so, the landscape of the reclaimed mine would look very much like undisturbed landscape in the area.

4.5.16 Noise

Existing land uses within the PRB (e.g., mining, livestock grazing, oil and gas production, transportation, and recreation) contribute to noise levels, but wind is generally the primary noise source. Mining on the LBA Tract would not increase the number of noise-producing facilities within the PRB, but it would lengthen the time this particular noise source would exist and may augment the level of impacts to other resources (e.g., increased exposure of wildlife to noise impact, increased noise impacts to recreational users). Mining-related noise is generally masked by the wind at short distances, so cumulative overlap of noise impacts between mines is not likely.

Recreational users and grazing lessees utilizing lands surrounding active mining areas do hear mining-related noise; but this has not been reported to cause a significant impact. As stated above, wildlife in the immediate vicinity of mining may be adversely affected by noise; however, observations at other surface coal mines in the area indicate that wildlife generally adapt to noise conditions associated with active coal mining.

Cumulative increases in noise from trains serving the PRB mines have caused substantial increases (more than five dBA) in noise levels along segments of the rail lines over which the coal is transported to markets. However, no significant adverse impacts have been reported as a result.

4.5.17 Transportation Facilities

New or enhanced transportation facilities (road, railroads, and pipelines) are expected to occur as a result of energy development in the Powder River Basin. However, no new cumulative impacts to transportation facilities are expected to occur as a direct result of leasing and subsequent mining of the North Jacobs Ranch LBA Tract. The transportation facilities for the Jacobs Ranch Mine are already in place. Traffic levels from the mine will be maintained for a longer period under the action alternatives.

4.5.18 Socioeconomics

Because of all the energy-related development that has been occurring in and around Campbell and Converse Counties during the past 30 years, socioeconomic impacts are a major concern. Wyoming's economy has been structured around the basic industries of extractive minerals, agriculture, tourism, timber, and manufacturing. Each of these basic industries is important, and the extractive mineral industry has long been a vital part of Wyoming's economy. Many Wyoming communities depend on the mineral industry for much of their economic well being. The minerals industry is by far the largest single contributor to the economy of Wyoming. In 1999 valuation on minerals produced in 1998 was $3,435,709,958. This was 49 percent of the State's total valuation and placed Wyoming among the top ten mineral producing states in the nation (Wyoming Department of Revenue 2000). Because most minerals are taxed as a percentage of their assessed valuation, this makes the mineral industry a significant revenue base for both local and state government in Wyoming.

Since 1989, coal production in the Powder River Basin has increased by an average of 6.8 percent per year. WSGS projects coal production in Campbell County to increase by about 1 percent per year from 2000 through 2005, while Converse County coal production is projected to remain steady at 25 mmtpy through this period. In 1998, Wyoming coal supplied approximately 29 percent of the United States' steam coal needs when PRB coal was used to generate electricity for public consumption in 25 states as well as Canada and Spain (Lyman and Hallberg 1999). Electricity consumers in those states benefit from low prices for PRB coal, from cleaner air due to the low sulfur content of the coal, and from the royalties and bonus payments that the federal government receives from the coal.

Locally, continued sale of PRB coal helps stabilize municipal, county, and state economies. By 2005, annual coal production is projected to generate about $2.6 billion of total economic activity, including $351 million of personal income, and support the equivalent of nearly 15,885 full-time positions (BLM 1996a).

Three tracts (the Powder River, Thundercloud, and Horse Creek tracts) were recently leased in southern Campbell County and the surrounding area. Projected employment increases of up to 390 persons were predicted as a result of mining these tracts. Up to 18 additional jobs are predicted if the North Jacobs Ranch LBA Tract is mined. In combination, mining of these four LBA tracts could result in up to 408 jobs.

In addition to the North Jacobs Ranch LBA Tract a number of mineral and related developments have occurred, are in progress, or are anticipated in Campbell County and the surrounding area. The North Rochelle Mine located southeast of Wright, WY has completed an $83.6 million mine construction phase. Construction of the mine facilities began in June 1997 and was completed in 1999.

The Two Elk plant is currently in the developmental stage, and North American Power Group is working on permitting and marketing. According to a recent article in the Gillette News Record, construction of the Two Elk plant could begin in 2000; the cost for constructing the proposed plant is estimated at $300 million; construction could last three years; and the construction-phase work force could peak at more than 600 persons. (Gillette News Record 2000a). The Black Hills Wygen#1 power plant is anticipated to be operational by January, 2003. The Black Hills Corporation estimates that the project will employ approximately 300 people during the construction period (Black Hills Corporation press release, 9/27/2000).

According to information provided by the Dakota, Minnesota & Eastern Railroad Corporation, construction of the DM&E railroad line was expected to start in 1999, take two years to complete and cost $1.5 billion. For Wyoming, the estimated direct construction-phase work force is 700 persons. DM&E received preliminary approval from the Surface Transportation Board in December 1998. The Surface Transportation Board released the draft EIS for public comment in September 2000.

Currently, Gillette is experiencing a population increase as a result of CBM development in this area. According to a March 26, 2000 article in the Gillette News Record, in the past year Gillette's population has increased, unemployment has decreased, housing has becoming increasingly tight, and traffic and criminal activity have increased (Gillette News Record 2000b). School enrollment has not seen an increase over last year, however.

If all of the new projects are undertaken, it is likely that the population in northeastern Wyoming would continue to grow, and there would be increasing demands on housing, schools, roads, law enforcement, etc. in the communities in this area. The population increase would be expected to be somewhat dispersed among all of the communities in the area, which would include Douglas, Wright, and Newcastle as well as Gillette. The extent of the impacts to the local communities would depend on the amount of overlap between the construction periods on the proposed projects. It was previously estimated that construction of the North Rochelle, ENCOAL and Two Elk projects could have added up to 2,900 people in northeastern Wyoming if they had been undertaken at the same time. As it has actually happened, development of these projects has not occurred concurrently. The North Rochelle construction project has been completed, CBM development is currently contributing to population in the Gillette area, construction at the Two Elk and Wygen #1 power plants could begin in 2000, construction of the proposed DM&E railroad is waiting on completion of the environmental analyses, and the ENCOAL project has been postponed indefinitely. The potential increase in mining employment will probably occur gradually as new coal leases are permitted for mining.

During the construction phase of the developmental projects, assistance money could total $7.5 million for Gillette, $4.43 million for Campbell County and $527,000 for Wright (Planning Information Corp. 1997). Assuming local sales and use tax permits are required, the developmental projects if approved would generate about $12.5 million for Gillette, Wright and Campbell County. The State of Wyoming would receive approximately $16.99 million from the developmental projects. Ad valorem tax is paid on production and property (Wyoming; Department of Commerce, Energy Section 1997). If all three developmental projects had proceeded as planned, ad valorem tax paid in 2001 was estimated to approach $10 million (Gillette News Record 1996).

4.6 The Relationship Between Local Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

From 2000 on, the Jacobs Ranch Mine would be able to produce coal at the permitted production level for another 20 years under the Proposed

Action and, for 17 years under Alternative 2, and 14 years under Alternative 3. As the coal is mined, almost all components of the present ecological system, which have developed over a long period of time, would be modified. In partial consequence, the reclaimed land would be topographically lower, and although it would resemble original contours, it would lack some of the original diversity of geometric form.

The forage and associated grazing and wildlife habitat that the LBA Tract provides would be temporarily lost during mining and reclamation. During mining of the LBA Tract there would be a combined loss of native vegetation on 5,364 acres (Proposed Action) or 5,465 acres (Alternative 2), or 3,689 acres (Alternative 3) with an accompanying disturbance of wildlife habitat and grazing land. This disturbance would occur incrementally over a period of years. The mine site would be returned to equivalent or better forage production capacity for domestic livestock before the performance bond is released. Long-term productivity would depend largely on postmining range-management practices, which to a large extent would be controlled by private landowners.

Mining would disturb pronghorn habitat, but the LBA Tract would be suitable for pronghorn following successful reclamation. Despite loss and displacement of wildlife during mining, it is anticipated that reclaimed habitat would support a diversity of wildlife species similar to premining conditions. The diversity of species found in undisturbed rangeland would not be completely restored on the leased lands for an estimated 50 years after the initiation of disturbance. Re-establishment of mature sagebrush habitat--which is crucial for pronghorn and sage grouse--could take even longer.

There would be a deterioration of the groundwater quality in the lease area because of mining; however, the water quality would still be adequate for livestock and wildlife. This deterioration would probably occur over a long period of time. During mining, depth to groundwater would increase only within one mile away from the pits in the coal aquifer. The water levels in the coal aquifer should return to premining levels at some time (probably less than 100 years) after mining has ceased.

Mining operations and associated activities would degrade the air quality and visual resources of the area on a short-term basis. Following coal removal, removal of surface facilities, and completion of reclamation, there would be no long-term impact on air quality. The long-term impact on visual resources would be negligible.

Short-term impacts to recreation values may occur from reduction in big game populations due to habitat disturbance. These changes would primarily impact hunting in the lease area. However, because reclamation would result in a wildlife habitat similar to that which presently exists, there should be no long-term adverse impacts on recreation.

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The Proposed Action, Alternative 2, and Alternative 3 would extend the life of Jacobs Ranch Mine by 12.3, 12.1, and 7.6 years, respectively, thereby enhancing the long-term economy of the region.

4.7 Irreversible and Irretrievable Commitments of Resources

The major commitment of resources would be the mining and consumption of 467 million tons (Proposed Action), or 471 million tons (Alternative 2), or 285 millions tons (Alternative 3) of coal to be used for electrical power generation. CBM that is not recovered prior to mining would also be irreversibly and irretrievably lost. It is estimated that 1-2 percent of the energy produced would be required to mine the coal, and this energy would also be irretrievably lost.

The quality of topsoil on approximately 5,364 acres (Proposed Action), or 5,465 acres (Alternative 2), or 3,689 acres (Alternative 3) would be irreversibly changed. Soil formation processes, although continuing, would be irreversibly altered during mining-related activities. Newly formed soil material would be unlike that in the natural landscape.

Loss of life may conceivably occur due to the mining operation and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming as determined by the Mine Safety and Health Administration (1997) for the 10-year period 1987-1996, fatal accidents (excluding contractors) occur at the rate of 0.003 per 200,000 man-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 man-hours worked. Any injury or loss of life would be an irretrievable commitment of human resources.

Disturbance of all known historic and prehistoric sites on the mine area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological values would be irreversible and irretrievable.

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5.0 CONSULTATION AND COORDINATION

In addition to this EIS, other factors and consultations are considered and play a major role in determining the decision on this proposed lease application. These include the following.

Regional Coal Team Consultation. The North Jacobs Ranch lease application was reviewed and discussed at the February 23, 1999, PRRCT public meeting in Billings, Montana and the October 27, 1999 PRRCT public meeting in Gillette Wyoming. The PRRCT determined that the land in the application met the qualifications for processing as a production maintenance tract and recommended that the application be processed as a maintenance lease by application, pending resolution of the conflict between proposed coal mining and existing and proposed oil and gas development, including CBM.

Governor's Consultation. The BLM Wyoming State Director notified the Governor of Wyoming on October 28, 1998, that JRCC had filed a lease application with BLM for the North Jacobs Ranch Tract.

Public Notice. The BLM published a Notice of Scoping in the *Federal Register* on October 7, 1999, serving notice that the North Jacobs Ranch coal lease application had been received and public comment was requested. A public scoping meeting was held on October 19, 1999 in Gillette, Wyoming. BLM published a Notice of Intent to Prepare an Environmental Impact Statement in the Federal Register on January 19, 2000. This notice included a second request for public comment. This second comment period was open through February 15, 2000, to allow consideration of any new comments to be addressed in this draft EIS. The BLM and the EPA will each publish a Notice of Availability in the Federal Register for this draft EIS. The public comment period on this draft EIS will last 60 days. Following the comment period on the draft EIS, a final EIS will be prepared. Comments from the public, state and federal review agencies will be considered in preparing the final EIS, and BLM will respond to these comments in the final EIS.

Attorney General Consultation. After a coal lease sale, but prior to issuance of a lease, the BLM will solicit the opinion of the U.S. Attorney General on whether the planned lease issuance creates a situation inconsistent with federal anti-trust laws.

Other Consultations. Other federal, state, and local governmental agencies that were directly consulted in preparation of this EIS are listed in Table 5-1.

List of Preparers. Table 5-2 provides a listing of the BLM interdisciplinary team and the third-party consultant personnel who prepared this EIS.

Distribution List. This EIS was distributed to numerous congressional offices, federal agencies, state governments, local governments, industry representatives, interest groups, and individuals for their review and comment (Table 5-3).

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Table 5-1. Other Federal, State, and Local Governmental Agencies Consulted in EIS Preparation

Agency or Organization	**Individual**	**Position**
Converse County	Mike Sears	Planning Director
Powder River Regional Coal Team	5 Voting Members and 21 Nonvoting Members	
Wyoming Game and Fish Department	Lynn Jahnke	Wildlife & Fish Supervisor
Wyoming Department of Environmental Quality		
Air Quality Division	Mike Warren	Sr. Analyst
	Dianna Grant	Sr. Analyst
	Tina Jenkins	Sr. Analyst
	Judy Shamley	Sr. Analyst
Land Quality Division	Jon Sweet	Sr. Analyst
	Lanny Goyn	Sr. Analyst
Wyoming State Geological Survey	Rod DeBruin	Oil & Gas Geologist
	Bob Lyman	Coal Geologist
Wyoming Oil and Gas Commission	Don Likwartz	Supervisor
Wyoming Department of Commerce	Dale Hoffman	Mineral Tax Division Director
Wyoming Department of Information and Administration	Wenlin Liu	Division of Economic Analysis, Senior Economist
Wyoming Department of Revenue	Dean Ternte	Sr. Economist
Wyoming Employment Center	Betsy Hockert	Analyst

Table 5-2. List of Preparers

Name	Education/Experience	Responsibility
BLM/USFS/OSM INTERDISCIPLINARY TEAM		
Core Team		
Nancy Doelger, BLM	M.S., B.S. Geology, 24 years professional experience (Licensed Wyoming Geologist)	Project Coordinator
Mike Karbs, BLM	M.S., Regional Planning and Public Policy, B.S., Mineral Engineering, 26 years professional experience	Document Reviewer
Mel Schlagel, BLM	M.S., Agricultural Economics, 33 years professional experience	Document Reviewer
Floyd McMullen, OSM	M.S., Environmental Science, B.S., Range/Forest Management, 27 years professional experience	Project Coordinator
Support Team		
Norman Braz, BLM	M.S., B.S. Geology, 19 years professional experience (Licensed Wyoming Geologist)	Geologist
Luben Ouano, BLM	B.S., Civil Engineering, 21 years professional experience	Mining Engineering
Mavis Love, BLM	19 years professional experience	Adjudicator
B.J. Earle, BLM	B.A., Archaeology, 23 years professional experience	Cultural Resources
Laurie Bryant, BLM	Ph.D., Paleontology, 37 years professional experience	Paleontological Resources
Larry Gerard, BLM	B.S., Wildlife Management, 23 years professional experience	Wildlife Resources
Mike Brogan, BLM	B.S. Watershed Management/Hydrology /Forestry, 21 years professional experience	Hydrology
Joe Meyer, BLM	B.S. Watershed Management/Soils Minor, 17 years professional experience	Soils
Tim Nowak, BLM	M.A., Anthropology/Archaeology, 32 years professional experience	Native American Consultation
Susan Caplan, BLM	M.S., Air Resource Management, B.S., Meterology & Mathematics, 15 years professional experience.	Air Quality
WESTERN WATER CONSULTANTS, INC.		
Doyl Fritz	M.S., B.S. Civil Engineering, 30 years professional experience (Licensed Professional Engineer)	Report Preparation
Mike Evers	M.S., B.S. Geology, 16 years professional experience (Licensed Wyoming Geologist)	Project Management, Report Preparation

Ken Collier	B.S. Geology, 23 years professional experience (Licensed Wyoming Geologist)	Report Preparation
Mal McGill	1 year professional experience	CADD
Rodney Ventling	10 years professional experience	CADD
Heidi Peterson	9 years professional experience	Document Production

INTERMOUNTAIN RESOURCES

Jim Orpet	M.S. Range Management, B.S. Wildlife Management, 21 years professional experience	Physical Resources
Bill Glenn	B.S. Agronomy, 33 years professional experience	Soil Baseline
Russell Tait	B.S. Wildlife Management, 6 years professional experience	Wildlife Baseline

GCM SERVICES, INC.

David Ferguson	M.A. Anthropology, 13 years experience	Cultural Resources
Garren Meyer	B.A. Anthropology, 9 years experience	Cultural Resources

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Table 5-3. Distribution List - Draft EIS

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Governor of Wyoming
Cheyenne, WY

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Governor of Montana
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BLM Wyoming State Director
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Matt Millenbach
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Alan Rabinoff
BLM Deputy State Director
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Powder River Regional Coal Team
Non-Voting Members & Alternate Voting Members

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State Of Montana

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Northern Cheyenne Tribal Council
Lame Deer, MT

Madame Chairman Clara Nomee
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Casper, WY

U.S. Senator Michael Enzi
Casper, WY
Gillette, WY

U.S. Senator Craig Thomas
Casper, WY
Sheridan, WY

U.S. Senate Committee on Environment & Public Works
Washington, D.C.

Federal Agencies

Bureau of Indian Affairs
Washington D.C.

Bureau of Land Management
Rawlins, WY
Buffalo, WY
Miles City, MT
Washington, D.C.

Bureau of Reclamation
Denver, CO
Washington D.C.

Federal Highway Admin.
Washington, D.C.

Minerals Management Serv.
Denver, CO
Herndon, VA

National Park Service
Lakewood, CO
Washington, D.C.

Office of Surface Mining
Reclamation & Enforcement
Casper, WY
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U.S. Fish & Wildlife Service
Arlington, VA
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U.S. Army Corps of Engineers
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U.S. Dept. of the Interior
Denver, CO

OEPC, Washington, D.C.
Natural Resources Library,
Washington, D.C.

U.S. Dept. of Agriculture
Forest Service
Lakewood, CO
Washington, D.C.

U.S. Department of Energy
Washington, D.C.
Casper, WY

U.S. Environmental Protection
Agency,
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Office of Federal Activities,
Washington, D.C.

U.S. Geological Survey
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State Government

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Representative Jim Anderson
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Representative Rick Badgett
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Representative Nick Deegan
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Senator John Schiffer
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Wyoming Dept. of
Employment
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Wyoming Department of
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Wyoming Director of Federal
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Wyoming Oil and Gas
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Wyoming Parks & Cultural
Resources Department
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Wyoming Public Service
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Wyoming State Clearinghouse
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Wyoming State Engineer's Office
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Wyoming State Geological Survey
Laramie, WY

Wyoming State Inspector of Mines
Rock Springs, WY

Wyoming Water Development Commission
Cheyenne, WY

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Campbell Co. Commissioners
Gillette, WY

Campbell County School Superintendent
Gillette, WY

City of Douglas
Douglas, WY

City of Gillette
Gillette, WY

Converse Co. Commissioner
Mr. Leon Chamberlain
Douglas, WY

Converse Co. Commissioners
Douglas, WY

Converse Co. Joint Powers Board
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Converse Co. Planning Office
Douglas, WY

Converse Co. School District
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Cheyenne River Sioux Tribal Administration
Eagle Butte, SD

Flandreau Santee Sioux Executive Committee
Flandreau, SD

Crow Creek Sioux Tribal Council
Fort Thompson, SD

Oglala Sioux Tribal Council
Pine Ridge, SD

Lower Brule Sioux Tribe
Lower Brule, SD

Rosebud Sioux Tribe
Rosebud, SD

Industry and Business

RAG Coal West
Gillette, WY

American Colloid Co.
Belle Fourche, SD

Antelope Coal Company
Gillette, WY

Ark Land Company
Fairview, IL

Arnjac
Laramie, WY

Baccari & Associates
Sheridan, WY

Barrett Resources Corp.
Denver, CO

Belle Ayr Mine
Gillette, WY

Bjork, Lindley, Danielson & Baker, P.C.
Denver, CO

Bridgeview Coal Company
Farmington, PA

Bucksin Mine
Gillette, WY

Burlington Northern Railroad
Fort Worth, TX

Burns & McDonnell
Kansas City, MO

BXG, Inc.
Boulder, CO

Celsius Energy Co.
Denver, CO

C.H. Snyder Company
Kittanning, PA

CE&MT, Inc.
Gillette, WY

CH2M Hill
Englewood, CO

Citation 1994 Investment
Houston, TX

Consol, Inc.
Pinckneyville, IL

Cordero-Rojo Mine Complex
Gillette, WY

Davis Oil Co.
Denver, CO

Decker Coal Company
Omaha, NE

Duke Energy
Denver, CO

Douglas Chamber of Commerce
Douglas, WY

Dry Fork Coal Company
Gillette, WY

Eagle Butte Mine
Gillette, WY

ECC
Casper, WY

ENCOAL
Gillette, WY

Evergreen Enterprises
Casper, WY

Exxon Corporation
Houston, TX

Foster-Wheeler Environmental
Lakewood, CO

GCM Services Inc.
Butte, MT

Gerald Jacob
Environmental Const.
Boulder, CO

Gillette Chamber of Commerce
Gillette, WY

Glenrock Coal Co.
Glenrock, WY

Greystone
Greenwood, CO

Hardin & Associates
Castle Rock, CO

Hunt Oil Co.
Dalles, TX

Ind. Consultant Network
Brian Kennedy
Boulder, CO

Intermountain Resources
Laramie, WY

Inexco Oil Co.
Midland, TX

Jacobs Land & Livestock Co.
Magna, UT

Jacobs Ranch Coal Corp.
Gillette, WY

KN Energy
Lakewood, CO

Keeline Coal Trust
Casper, WY

Kennecott Energy Company
Gillette, WY

Kenneth R. Paulsen Consulting
Arvada, CO

Key Production Co.
Denver, CO

Kfx Wyoming
Gillette, WY

L.E. Peabody & Associates
Alexandria, VA

M&K Oil Company
Gillette, WY

Marston & Marston
St. Louis, MO

McGraw-Hill
Washington D.C.

Meineadair Consultants
Arvada, CO

Merit Energy Partners
Dalles, TX

Mine Engineers, Inc.
Cheyenne, WY

Mining Associates of Wyoming
Casper, WY

Nerco Coal Co.
Ione, CA

North Rochelle Mine
Gillette, WY

Oilfield Salvage Co.
Englewood, CO

P&M Coal Company
Englewood, CO

PacifiCorp/Interwest Mining Company
Salt Lake City, UT

PIC Technologies
Denver, CO

PIP Energy IV-80
Boston, MA

Pepper Tank Co.

Perry R. Bass Inc.
Fort Worth, TX

Poudre Environmental Consultants
Ft. Collins, CO

Powder River Eagle Studies Inc.
Gillette, WY

Powder River Coal Company
Gillette, WY

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Powder River Energy Corp.
Sundance, WY

Powder River Oil & Gas Vent.
Denver, CO

Redstone Resources
Newcastle, WY

Riverside Technology, Inc.
Fort Collins, CO

Royal Gold, Inc.
Denver, CO

San Juan Coal Co.
Waterflow, NM

Shea & Gardner
Washington, D.C.

The Rim Companies
Englewood, CO

Thunder Basin Coal Company
Wright, WY

Tom Brown Inc.
Denver, CO

Torch Energy
Houston, TX

TRC Mariah Associates Inc.
Laramie, WY

TRC Environmental
Englewood, CO

Triton Coal Company
Gillette, WY

URS Greiner Woodward Clyde
Denver, CO

US West Communications
Casper, WY
Denver, CO

WWC Engineering
Sheridan, WY

Wellstar Corporation
Platteville, CO

Western Gas Resources
Denver, CO

Western Fuels Association
Lakewood, CO

Western Energy Co.
Colstrip, MT

Wright Chamber of Commerce
Wright, WY

Wyodak Resources Dev. Corporation
Gillette, WY

Yates Drilling Company
Artesia, NM

Interest Groups & Professional Societies

Advisory Council on Historic Preservation
Golden, CO

Audubon Society
Casper, WY
Cheyenne, WY
Sheridan, WY

Foundation for North American Wild Sheep
Cody, WY

Friends of the Bow/ Biodiversity Associates
Laramie, WY

Institute for Policy Research
Northwestern University
Evanston, IL

Izaak Walton League of America
Casper, WY

Inyan Kara Grazing Assoc.
Newcastle, WY

Law Fund
Boulder, CO

Medicine Wheel Alliance
Huntley, MT

National Mining Association
Washington, D.C.

National Wildlife Federation
Washington, D.C.

Natural Resources Defense Council
San Francisco, CA

Petroleum Assoc. of Wyoming
Casper, WY

Powder River Basin Resource Council
Sheridan, WY

Sierra Club
Sheridan, WY

The Fund for Animals
Jackson, WY

The Nature Conservancy
Laramie, WY

Thunder Basin Grazing Assoc
Douglas, WY

Wildlife Management Institute
Fort Collins, CO

Wind River Multiple Use Advocates
Riverton, WY

Wyoming Stock Growers Assoc.
Cheyenne, WY

Wyoming Wildlife Federation
Cheyenne, WY

Wyoming Geological Assoc.
Casper, WY

Wyoming Outdoor Council
Lander, WY

Wyoming Association of Professional Archaeologists
Casper, WY
Laramie, WY

Wyoming Bankers Association
Cheyenne, WY

Wyoming Wool Growers Association
Casper, WY

Wyoming Mining Association
Cheyenne, WY

Wyoming Heritage Society
Casper, WY

Wyoming Public Lands Council
Casper, WY

Individuals

Ralph Barbero

Scott Benson

Sheldon Bierman

Charles A Brenk

William C. Brenk

Joseph E. Casselus

William A. Clough

Ruth Corley

Cecil Cundy

Ladd Frary

Elizabeth Goodnough

Nancy Higgins

D&J Jacobs Family Trust

The Daniels Trust

Larry E. Dunlap

Lee E. Dunlap

Zeta Dunlap Trust #1

George R. & Elaine Keeline Trust

Barbara Jean Fleischman

Patrick & Peggy Flinn

Joyce Allen Hanson

Joseph M. Hays

Robert H. Hays

Betty R. Hewit

William H. Edelman Trust

Shirley R. Hood

Polly Ann Hopkins

The E. Bradley Huidepohl Trust

John A. Jacobs

Rex W. & Marjorie Johnson Trust

Harry W. Keeline, III

George C. Kennedy

John Kimberlin

Richard K. Lisco

Louis S. Madrid

Wendy Jo McCroskey

Clarke K. Mills Trust

Dale Mills Trust

Ralph & Laura Mills

Alice L. Monden

F. L. Natta

Jack Nisselius Trust

Hazel K. Nisselius Trust

T.E. Nordgren

Gladys K. Norwood

Betty Jo Oertle Trust

Ted Olson

Axel R. Ostlund Trust

Mary V. Ostlund Trust

Robert L. Penner

Wilbert H. Penner

John Pexton

Asa Reed

C.J. Robertson

Sarah M. Roe

Bill Saulcy

Dave Shippy

Martha Sizemore

Lynn D. & Lee R. Smith

Shirley Spansberg

Donald K. Springen

Ken and Sylvia Revland

Kenneth C. Revland Trust

Vern G. Thomas

Dean Unruh

Florence Unruh

Carl C. Williams

George Woolsey

John Williams

Mark Winland

Libraries

The Libraries
Colorado State University
Fort Collins, CO

Univ. of Wyoming Libraries
Laramie, WY

Media

Coal Daily
Washington, D.C.

Gillette News-Record
Gillette, WY

Rocky Mountain Oil Journal
Denver, CO

Western Coal Newsletter
Knoxville, TN

Cheyenne-Wyoming Eagle
Cheyenne, WY

Associated Press
Cheyenne, WY

Casper Journal
Casper, WY

Casper Star-Tribune
Casper, WY

The Douglas Budget
Douglas, WY

6.0 REFERENCES CITED

Applied Hydrology & Associates (AHA), 1999, Technical Report on Groundwater Modeling of CBM Development, Powder River Basin, Wyoming. Prepared by AHA for the BLM, Buffalo, Wyoming.

Bayles, Judy, Bayles Realty, personal communication, March 7, 2000.

Brown, Boyd, Campbell County High School, personal communication, October 16, 2000.

Bureau of Land Management, 1974, Final Environmental Impact Statement, Eastern Powder River Basin of Wyoming. U.S. Department of the Interior, Bureau of Land Management.

____, 1979, Final Environmental Impact Statement, Proposed Development of Coal Resources in the Eastern Powder River Wyoming. U.S. Department of the Interior, Bureau of Land Management, Washington, D.C.

____, 1981, Final Powder River Regional Coal Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Cheyenne, Wyoming.

____, 1984, Draft Environmental Impact Statement for Round II Coal Lease Sale in the Powder River Region. U.S. Department of the Interior, Bureau of Land Management, State Office, Cheyenne, Wyoming.

____, 1985, Buffalo Area Resource Management Plan Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Buffalo Resource Area, Casper, Wyoming.

____, 1988, NEPA Handbook H-1790-1. U.S. Department of the Interior, Bureau of Land Management.

____, 1989, Manual 3420, Competitive Coal Leasing. U.S. Department of the Interior, Bureau of Land Management.

____, 1991, Powder River Regional Coal Team Operational Guidelines for Coal Lease-By-Applications. U.S. Department of the Interior, Bureau of Land Management.

____, 1992a, Final Environmental Assessment for the West Black Thunder Coal Lease Application. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.

____, 1992b, Final West Rocky Butte Coal Lease Application Environmental Impact Statement. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.

____, 1996a, Draft Economic Summary for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.

____, 1996b, Draft Natural Systems Paper for the Buffalo Resource Area's Land Use Plan. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.

____, 1996c, Draft Environmental Consequences of Existing Management for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.

____, 1996d, Draft Existing Management of the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.

____, 1996e, Southern Powder River Basin Coal Leasing Study. U.S. Department of the Interior, Bureau of Land Management, State Office, Cheyenne, Wyoming.

____, 1996f, Coal Development Status Check Powder River Federal Coal Region Montana & Wyoming Data Tables. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Casper, Wyoming.

____, 1996g, Draft Energy Resources Booklet for the Buffalo Resource Area. U.S. Department of the Interior, Bureau of Land Management, Casper District Office, Buffalo, Wyoming.

____, 1997, Draft and Final Gillette South CBM Project Environmental Impact Statement, U.S. Department of the Interior, Bureau of Land Management, Buffalo Resource Area, Buffalo, Wyoming.

____, February 1998, Final Environmental Impact Statement for the Powder River Coal Lease Application (WYW136142) and Thundercloud Coal Lease Application (WYW1361458), Casper District Office.

____, 1999a, Wyodak Coal Bed Methane Project Draft Environmental Impact Statement. Buffalo Field Office, May 1999.

____, 1999b, Final Environmental Assessment WY-070-EA-9-191 for the Proposed Enron (Belco)-BLM Coal Lease Exchange WYW322794. Casper Field Office, October 1999.

____, 1999c, Wyodak Coal Bed Methane Project Final Environmental Impact Statement. Buffalo Field Office, October 1999.

____, 1999d, Resource Recovery and Protection Plan for the Jacobs Ranch Mine. U.S. Department of

222

the Interior, Bureau of Land Management.

___, 2000a, Final Environmental Impact Statement for the Horse Creek Lease Application (WYW141435), Casper Field Office.

___, 2000b, Instruction Memorandum No. 2000-081, Policy on Conflicts between CBM and Coal Development, February 2000.

Buresh, Tammy, Wright Water and Sewer District, personal communication, October 17, 2000.

Campbell County Economic Development Corporation, 1997, Community Profile and Business Profile, Campbell County, Wyoming.

___, June 2000, information acquired from website on the internet: <http://www.ccedc.net>.

City of Gillette, 1978, City of Gillette/Campbell County Comprehensive Planning Program. Gillette, Wyoming.

Coal Outlook Supplement, August 9, 1999, "Wyoming PRB ready for 523.4 Million Tons", Financial Times Energy.

Crist, M.A., 1991, Evaluation of groundwater-level changes near Gillette, northeastern Wyoming. U.S. Geological Survey, Water Resources Investigations Report 88-4196.

Dailey, Bernard J., March 3, 2000, personal communication (permitted production capacity by mine as of 10/1/99).

Dakota, Minnesota & Eastern Railroad Corporation, 1998, DM&E Website, <http://www.cmerail.com>. Site includes links to news, STB application, maps and other company information.

DeBruin, R.H., 1996, Oil and gas map of Wyoming: Wyoming State Geological Survey Map Series MS-48, scale 1:500,000.

DeBruin, R.H., and Jones, R.W., 1989, Coalbed methane in Wyoming: Guidebook on gas resources of Wyoming, pp. 97-104.

ENCOAL, 1997, Groundwater supply and yield analysis for the ENCOAL LFC™ Plant, Water Supply Wells at North Rochelle Mine. Submitted to Wyoming State Engineer.

GCM Services, Inc., March 2000, A Class III Cultural Resource Inventory of the Jacobs Ranch Coal Company's North Study Area and North Study Area (East), Campbell County, Wyoming.

Gillette News Record, 1996, "Big projects could bring local boom", Deb Holbert, December 18.

___, 1997, "Gillette population takes a downswing", Valerie Kiger, December 11.

___, 2000a, "Power plant work could begin in June", Dustin Bleizeffer, March 16.

___, 2000b, "Gas explosion", Kristy Gay, March 26.

Greystone Environmental Consultants, Inc., 1999. Draft Technical Reference Document, Wyodak CBM Project Air Quality Impact Analysis. Prepared by Greystone for BLM, Buffalo, Wyoming.

Hadley, R.F. and Schumm S.A., 1961, Sediment sources and drainage basin characteristics in Upper Cheyenne River Basin, United States Department of Interior, U.S. Geological Survey Water Supply Paper 1531-B.

Hockert, Betsy, Wyoming Employment Center, Gillette, personal communication, October 17, 2000.

Hodson, W.G., R.H. Pearl and S.A. Druse, 1973, Water Resources of the Powder River Basin and Adjacent Areas, Northeastern Wyoming. USGS Hydrologic Investigations Atlas HA-465.

Hollaway, Deirdre, Horizon Realty, personal communication, March 7, 2000.

Houghton R.L., D.L. Fisher, and G.H. Groenewold, 1987, Hydrogeochemistry of the Upper Part of the Fort Union Group in the Gascoyne Lignite strip-mining area, North Dakota. U.S. Geological Survey Professional Paper 1340. 104 pp.

Humphries, Mark, OSM Casper, personal communication, September 2000.

Hydro-Engineering, 1991a, GAGMO 1991 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1991b, GAGMO 10-year Report. Prepared for Gillette Area Groundwater Monitoring Organization.

___, 1992, GAGMO 1992 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1993, GAGMO 1993 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1994, GAGMO 1994 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1995, GAGMO 1995 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1996a, GAGMO 15-year Report. Prepared for Gillette Area Groundwater Monitoring Organization.

___, 1996b, 1996 GAGMO Annual Report. Prepared for Gillette Area Groundwater Monitoring Organization.

___, 1997, GAGMO 1997 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1998, GAGMO 1998 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

___, 1999, GAGMO 1999 Annual Report. Prepared for the Gillette Area Groundwater Monitoring Organization.

IMPROVE, 1995, Visibility report from 1992-1995 acquired from the EPA's Ambient Monitoring Technology Information Center (AMTIC) website, <http://www.epa.gov/ttn/amtic/visdata.html>.

Jacobs Ranch Coal Company, 1995-1999, Annual Reports to WDEQ/AQD, on file in Cheyenne, Wyoming.

___, 1998, Lease by Application for the North Jacobs Ranch Tract, prepared October 2, 1998.

___, 1999a, Jacobs Ranch Mine Permit Application 271-T4 on file with WDEQ/LQD, Cheyenne, Wyoming.

___, 1999b, Annual Report to WDEQ/LQD, on file in Cheyenne, Wyoming.

___, 1999c, Section 21 Permit Application for Modification to Air Quality Permit No. MD-224 for the Jacobs Ranch Mine, prepared by TRC Environmental Corporation for Kennecott Energy.

Kerr-McKee Coal Corporation, Jacobs Ranch Mine, 1980-1994, Annual Reports to WDEQ/LQD, on file in Cheyenne, Wyoming.

Law, B.E., 1976, Large-scale compaction structures in the coal/bearing Fort Union and Wasatch Formations, northeast Powder River Basin, Wyoming: in *Wyoming Geological Association:* Guidebook on geology and energy resources of the Powder River Basin, pp. 221-229.

Law, B.E., D.D. Rice, and R.M. Flores, 1991, Coalbed gas accumulations in the Paleocene Fort Union Formation. Powder River Basin, Wyoming: in *Coalbed Methane of Western North America*: Guidebook for the Rocky Mountain Association of Geologists fall conference and field trip, Stephen D. Schwochow ed.

Lewis, B.D. and W.R. Hotchkiss, 1981, Thickness, percent sand, and configuration of shallow hydrogeological units in the Powder River Basin, Montana and Wyoming. U.S. Geological Survey Miscellaneous Investigation Series Map I-1317.

Lyman, R.M. and L.L. Hallberg, August 1999, Wyoming Coal Mines and Markets. Wyoming State geological Survey Coal Report CR-99-1.

Martin, L.J., D.L. Naftz, H.W. Lowham, and J.G. Rankl, 1988, Cumulative potential hydrologic impacts of surface coal mining in the eastern Powder River Structural Basin, northeastern Wyoming (CHIA). U.S. Geological Survey, Water Resources Investigations Report 88-4046. Prepared in cooperation with Wyoming Department of Environmental Quality and U.S. Office of Surface Mining, Cheyenne, Wyoming.

Martner, B.E., 1986, Wyoming Climate Atlas. Prepared in cooperation with the Wyoming Water Research Center, University of Wyoming.

Mine Safety and Health Administration, 1997, 645 Database, Wyoming Summary Employment and Injury Information.

National Oceanic and Atmospheric Administration, 1969, Climatography of the United States: Asheville, North Carolina, National Climatic Center, Climatological Summaries, No. 20-48.

North East Wyoming Economic Development Coalition (NEWEDC), 1997, Converse County Community Profile.

____, 2000, information acquired from website on the internet: <http://www.newedc.net>.

Oakleaf, B., B. Luce, S. Ritter, and A. Cerovski, 1992, Wyoming bird and mammal atlas. Wyoming Game and Fish Department, Cheyenne, Wyoming. 170 pp.

Oedekoven, O.O., 1994, Distribution, habitat use, and population dynamics of the Rochelle Hills elk herd, Final Report, Wyoming Game and Fish Department, Gillette, Wyoming.

Office of Surface Mining Reclamation and Enforcement, 1980, Noise impact assessment for the Caballo Rojo Mine. Unpublished Report prepared by James M. Montgomery, Consulting Engineers, Inc. Aurora, Colorado.

____, 1982, Assessment of Impacts on Bald Eagles, U.S. Department of the Interior, Office of Surface Mining Reclamation and Enforcement, Denver, Colorado.

____, 1984, Correlation and effect of mine facility wells on the Tullock Aquifer in the Gillette, Wyoming, vicinity. Prepared by G.E. McIntosh, C.A. Harrison, and J.V. Wilcox.

Olive, W.W., 1957, The Spotted Horse Coalfield, Sheridan and Campbell Counties, Wyoming: U.S. Geological Survey Bulletin 1050.

Planning Information Corporation, 1997, ENCOAL Corporation WISD Request for Waiver of Permit Application, prepared for ENCOAL Corporation.

Rehm, B.W., G.H. Groenewold, and K.A. Morin, 1980, Hydraulic properties of coal and related materials, Northern Great Plains: Groundwater, v. 18, no. 6, pp. 551-561.

Remington, T.E., and C.E. Braun, 1991, How surface coal mining affects sage grouse, North Park, Colorado. Pages 128-132 in *R.D. Comer, P.R. Davis, S.Q. Foster, C.V. Grant, S. Rush, O. Thorne, II, and J. Todd (eds.), Proceedings V*: Issues and technology in the management of impacted wildlife. Thorne Ecological Institute, Boulder, Colorado.

Resource Data International, 1998, Outlook for Coal and Competing Fuels.

Shamley, Judy, WDEQ/AQD, April 11, 2000, personal communication.

Thunder Basin Coal Company, Black Thunder Mine, 1980-1996, Annual Reports to WDEQ/LQD, on file in Cheyenne, Wyoming.

U.S. Army Corps of Engineers, 1987, Corps of Engineers Wetlands Delineation Manual, by the Environmental Laboratory, Department of the Army, Waterways Experiment Station.

U.S. Bureau of the Census, USA Counties 1996 CD-ROM.

USDA FS, 1999, Personal communication, T. Blett to W. Konkel (as referenced in Wyodak CBM DEIS).

USEPA, 1998, Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report: Recommendations for Modeling Long Range Transport Impacts Research Triangle Park, North Caroline (EPA-454/R-98-09).

USFS, 1985, Land and Resource Management Plan, Medicine Bow National Forest and Thunder Basin National Grassland, USDA Forest Service, October 1985.

____, 1987, Forest Service Handbook, FSH 2509-19 - Air Resource Management Handbook.

____, undated, unsuitability Criteria Assessment, High to Moderate Coal Potential, Thunder Basin National Grassland, Converse and Campbell Counties, Wyoming.

USFWS, March 16, 2000, Correspondence from Wyoming Field Office Supervisor Michael Long to Russel Tait of Intermountain Resources.

U.S. Geological Survey, 1995, 1995 National Assessment of United States Oil and Gas Resources Circular 1118.

University of Wyoming, 1994, Economic Impact of Coal on Wyoming's Economy. Cooperative Extension Service, Department of Agricultural Economics, College of Agriculture. B-987.

Van Voast, W.A and Reiten, J.C., 1988, Hydrogeologic response-twenty years of surface coal mining in southeastern Montana: Montana Bureau of Mines and Geology Memoir 62.

Wyoming Coal Information Committee, 1998, A Concise Guide to Wyoming Coal.

Wyoming Department of Administration and Information Division of Economic Analysis, March 1999, Wyoming Economic Forecast Report, 8th Edition.

___, February 2000, Outlook 2000: Joint Economic and Demographic Forecast to 2008. Prepared with Wyoming Department of Employment, Research and Planning.

Wyoming Department of Commerce, Energy Section, 1997, personal communication with Ed Schmidt.

Wyoming Department of Employment, Employment Resources Division, 1999 County Fact Sheet.

Wyoming Department of Employment, Research and Planning, March 2000, Wyoming Labor Force Statistics.

Wyoming Department of Employment, Employment Resources Division, Research and Planning, March 2000, Wyoming Labor Force Trends. Information acquired from website on the internet: <http://wydoe.state.wy.use/wrkforce>.

Wyoming Department of Employment, Research and Planning, October 2000, Information acquired from website on the internet: <http://lmi.state.wy.us/new.htm>.

Wyoming Department of Environmental Quality, Air Quality Division, 1989, Report on Air Quality Monitoring in Wyoming's Powder River Basin, 1980-1988.

___, Air Quality Division 1989-1997, Air Quality Monitoring Data on file with WDEQ/AQD, Cheyenne, Wyoming.

___, Air Quality Division, 1995, Air Quality Rules and Regulations.

Wyoming Department of Revenue, 2000, 1999 Annual Report. Information acquired November 7, 2000 from website on the internet: <http://revenue.state.wy.us>.

Wyoming Game and Fish Department, 1996, Wildlife Observation System, Wyoming Game and Fish Dept. Publ., Cheyenne, Wyoming.

___, 1998, Casper and Sheridan Region Big Game Herd Unit Reports.

Wyoming Oil and Gas Conservation Commission, June 2000, information acquired from WOGCC website <http://wogcc.state.wy.us>.

Wyoming State Engineer's Office, 2000, Retrieval of Groundwater and Surface Water Rights, May 2000, Cheyenne, Wyoming.

Wyoming State Geological Survey, 1994, Wyoming Geo-notes, No. 43, 49 pp.

___, 1996, No. 52, 59 pp.

___, 1997, No. 54, 66 pp.

___, 1998, No. 58, 73 pp.

___, 1999, No. 61, 79pp.

___, 2000, No. 67, 64 pp.

Wyoming State Inspector of Mines, 1990-1999, Annual Report of the State Inspector of Mines of Wyoming, Office of the State Inspector of Mines, Rock Springs, Wyoming.

Wyoming Water Resources Center, 1997, A study of techniques to assess surface and groundwater impacts associated with CBM and surface coal mining. In conjunction with WDEQ/LQD, SEO, WSGS, BLM and OSM.

Zeigler Coal Holding Company, August 29, 1997, Press release regarding ENCOAL plant.

7.0 GLOSSARY

aboriginal - Related to early or primitive cultures in a region.

ad valorem tax - A tax paid as a percentage of the assessed value of property.

adverse impact -An apparent direct or indirect detrimental effect.

aliquot - An exact portion.

alkalinity - The degree to which the pH of a substance is greater than 7.

alluvial deposit - Deposits of clay, silt, sand, gravel, and/or other materials carried by moving surface water, such as streams, and deposited at points of weak water flow; alluvium.

alluvial valley floors (AVFs) - An area of unconsolidated stream-laid deposits holding streams with water availability sufficient for subirrigation or flood irrigation agricultural activities (see 30 CFR 701.5).

alluvium - Sorted or semi-sorted sediment consisting of clay, silt, sand, gravel, or other unconsolidated rock material deposited in comparatively recent geologic time by a stream or other body of running water in the bed of that stream or on its flood plain or delta.

alternative - In terms of the National Environmental Policy Act, one of several substitute or alternate proposals that a federal agency is considering in an environmental analysis.

ambient -Surrounding conditions (or environment) in a given place and time.

annual precipitation - The quantity of water that falls yearly in the form of rain, hail, sleet, and snow.

approximate original contour - Post-mining surface configuration achieved by backfilling and grading of mined-out areas so that the reclaimed land surface resembles the general surface configuration of the land prior to mining (see 30 CFR 701.5).

aquatic - Living or growing in or on the water.

aquifer - A layer of permeable rock, sand, or gravel that stores and transmits water in sufficient quantities for a specific use.

aquitard - a confining bed that retards but does not totally prevent the flow of water to or from an adjacent aquifer; a leaky confining bed.

arithmetic mean - The sum of the values of n numbers divided by n. It is usually referred to as simply the "mean" or "average".

ash - The residual non-combustible matter in coal that comes from included silt, clay, silica, or other substances. The lower the ash content, the better the quality of the coal.

avian - Of, relating to, or derived from birds.

backfill - The operation of refilling an excavation. Also, the material placed in an excavation when it is refilled.

baseline - Conditions, including trends, existing in the human environment before a proposed action is begun; a benchmark state from which the environmental consequences of an action are forecast; the no-action alternative.

beneficial impact - An apparent direct or indirect advantageous effect.

bentonite - A clay formed by the decomposition of volcanic ash which has the ability to absorb large amounts of water and to expand to several times its normal volume; used in adhesives, cements and ceramic fillers.

bonus - That value in excess of the rentals and royalties that is paid to the United States as part of the consideration for receiving a lease for publicly owned minerals [see 43 CFR 3400.0-5(c)].

braided stream - A stream flowing in several dividing and reuniting channels resembling the strands of a braid.

buffer zone - An area between two different land uses that is intended to resist, absorb, or otherwise preclude development or intrusion between the two use areas.

bypass coal - An isolated part of a coal deposit that is not leased and that can only be economically mined in an environmentally sound manner as a part of continued mining by an existing adjacent operation [see 43 CFR 3400.0.5(d)].

clinker (scoria) - Baked and fused rock resulting from in-place burning of coal deposits.

coal bed methane - Methane gas that is generated during the coal-forming process.

colluvium - Rock fragments, sand, or soil material that accumulates at the base of slopes; slope wash.

confluence - The point at which two or more streams meet.

conglomerate - A rock that contains rounded rock fragments or pebbles cemented together by another mineral substance.

contiguous - Lands or legal subdivisions having a common boundary, lands having only a common corner are not contiguous.

cooperating agency - An agency which has jurisdiction by law in an action being analyzed in an environmental document and who is requested to participate in the NEPA process by the agency that is responsible for preparing the environmental document [see 40 CFR 1501.6 and 1508.5].

crucial wildlife habitat - Parts of the habitat necessary to sustain a wildlife population during periods of their life cycle. It may be a limiting factor on the population, such as nesting habitat or winter habitat.

cultural resources - The remains of human activity, occupation, or endeavor reflected in districts, sites, structures, buildings, objects, artifacts, ruins, works of art, architecture, and natural features that reveal the nature of historic and prehistoric human events. These resources consist of (1) physical remains, (2) areas where significant human events occurred, and (3) the environment immediately surrounding the resource.

cumulative impact - The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

decibel - A unit of sound measurement. In general, a sound doubles in loudness for every increase of 10 decibels.

deciview - A measure of view impairment (13 deciview equals a view of approximately 60 miles).

dip - The angle at which a rock layer is inclined from the horizontal.

direct (or primary) impact - An impact caused by an action that occurs at the same time and place as the action (see 40 CFR 1508.8).

discharge - Any of the ways that ground water comes out of the surface, including through springs, creeks, or being pumped from a well.

dissected upland - An upland or high area in which a large part of the original surface has been deeply cut into by streams.

dragline - A type of excavating crane that casts a rope- or cable-hung bucket a considerable distance, collects the dug material by pulling the bucket toward itself on the ground with a second rope or cable, elevates the bucket, and dumps the material on a backfill bank or pile.

eolian deposit - Sediment carried, formed, or deposited by the wind, as sand dunes.

ephemeral stream - A stream that flows occasionally because of surface runoff, and is not influenced by permanent ground water.

erosion - The wearing away of the land surface by running water, wind, ice or other geologic agents.

evapotranspiration - The sum total of water lost from the land by evaporation and plant transpiration.

excavation (archeological) - The scientifically controlled recovery of subsurface materials and information from a cultural site. Recovery techniques are relevant to research problems and are designed to produce maximum knowledge about the site's use, its relation to other sites and the natural environment, and its significance in the maintenance of the cultural system.

fair market value - The amount in cash, or in terms reasonably equivalent to cash, for which in all probability a coal deposit would be sold or leased by a knowledgeable owner willing but not obligated to sell or lease to a knowledgeable purchaser who desires but is not obligated to buy or lease.

fixed carbon - In coal, the solid combustible material remaining after removal of moisture, ash, and volatile matter. It is expressed as a percentage.

floodplain -The relatively flat area or lowland adjoining a body of flowing water, such as a river or stream, that is covered with water when the river or stream overflows its banks.

forage - Vegetation used for food by wildlife, particularly big game wildlife, and domestic livestock.

formation (geologic) - A rock body distinguishable from other rock bodies and useful for mapping or description. Formations may be combined into groups or subdivided into members.

fossil - The remains or traces of an organism or assemblage of organisms that have been preserved by natural processes in the earth's crust. Many minerals that may be of biologic origin are not considered to be fossils (e.g. oil, gas, asphalt, limestone).

geometric mean - The nth root of the product of the values of n positive numbers.

ground water - Subsurface water that fills available openings in rock or soil materials to the extent that they are considered water saturated.

habitat - A place where a plant or animal naturally or normally lives and grows.

habituation - The process of becoming accustomed to, or used to, something; acclimation.

hazardous materials - Substance which, because of its potential for corrosivity, toxicity, ignitability, chemical reactivity, or explosiveness, may cause injury to persons or damage to property.

hazardous waste - Those materials defined in Section 101 (14) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, and listed in 40 CFR § 261.

heterogenous - Made up of dissimilar constituents.

human environment - The natural and physical environment and the relationship of people with that environment (see 30 CFR 1508.14).

hydraulic conductivity - The capacity of a medium to transmit water; permeability coefficient. Expressed as the volume of water at the prevailing temperature that will move in unit time under a unit hydraulic gradient through a unit area. Units include gallons per day per square foot, centimeters per second.

hydraulic - Pertaining to fluid in motion, or to movement or action caused by water.

hydric soil - A soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic (water-loving) vegetation. Hydric soils that occur in areas having positive indicators of hydrophytic vegetation and wetland hydrology are wetland soils.

hydrocarbon - Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

hydrogeology - The science that deals with subsurface waters and with related geologic aspects of surface waters.

hydrology - The science dealing with the behavior of water as it occurs in the atmosphere, on the surface of the ground, and underground.

hydrophytic vegetation - The plant life growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content. When hydrophytic vegetation comprises a community where indicators of hydric soils and wetland hydrology also occur, the area has wetland vegetation.

impermeable - Not capable of transmitting fluids or gasses in appreciable quantities.

incised - Having a margin that is deeply and sharply notched.

indirect (or secondary) impact - A reasonably foreseeable impact resulting from an action but occurring later in time than or removed in distance from that action (see 40 CFR 1508.8).

in-place coal reserves - The estimated volume of all of the coal reserves in a lease without considering economic or technological factors which might restrict mining.

in-situ leach mining - Removal of the valuable components of a mineral deposit through chemical leaching without physical extraction of the rock.

interbedded - Layers of one type of rock, typically thin, that are laid between or that alternate with layers of another type of rock.

interburden -A layer of sedimentary rock that separates two mineable coal beds.

interdisciplinary - Characterized by participation or cooperation among two or more disciplines or fields of study.

intermittent stream - A stream that does not flow year-round but has some association with ground water for surface or subsurface flow.

laminated - Consolidated or unconsolidated sediment that is characterized by thin (less than 1 cm thick) layers.

land and resource management plan (LRMP) - A land use plan that directs the use and allocation of U.S. Forest Service lands and resources.

lead agency - The agency or agencies preparing or having taken primary responsibility for preparing an environmental document (see 40 CFR 1508.16).

lease (mineral) - A legal document executed between a mineral owner or lessor and another party or lessee which grants the lessee the right to extract minerals from the tract of land for which the lease has been obtained [see 43 CFR 3400.0-5(r)].

lek - A traditional breeding area for grouse species where territorial males display and establish dominance.

lenticular - Term describing a body of rock or earth that thins out in all directions from the center like a double convex optical lens.

limb (geologic) - One side of a fold (syncline or anticline).

limestone - A sedimentary rock consisting chiefly of calcium carbonate.

lineament - A linear topographic feature of regional extent that is believed to reflect crustal structure.

loadout facilities - The mine facilities used to load the mined coal for transport out of the mine.

loam - A rich, permeable soil composed of a mixture of clay, silt, sand, and organic matter.

maintenance tract - A federal coal tract that would continue or extend the life of an existing coal mine.

major federal action - An action with effects that may be major and which is potentially subject to federal control and responsibility (see 40 CFR 1508.18).

maximum economic recovery (MER) - The requirement that, based on standard industry operating practices, all profitable portions of a leased federal coal deposit must be mined. MER determinations will consider existing proven technology; commercially available and economically feasible equipment; coal quality, quantity, and marketability; safety, exploration, operating, processing, and transportation costs; and compliance with applicable laws and regulations [see 43 CFR 3480.0-5(a)(24)].

meteorological -Related to the science dealing with the atmosphere and its phenomena, especially as relating to weather.

methane - A colorless, odorless, and inflammable gas; the simplest hydrocarbon; chemical formula = CH_4. It is the principal constituent of natural gas and is also found associated with crude oil and coal.

mineable coal - Coal that can be economically mined using present day mining technology.

mineral rights - The rights of one who owns the mineral estate (subsurface).

mining permit - A permit to conduct surface coal mining and reclamation operations issued by the state regulatory authority pursuant to a state program or by the Secretary pursuant to a federal program (see 30 CFR 701.5).

mitigation - An action to avoid, minimize, reduce, eliminate, replace, or rectify the impact of a management practice.

mudstone - A hardened sedimentary rock consisting of clay. It is similar to shale but lacks distinct layers.

National Register of Historic Places (NRHP) - A list of districts, sites, buildings, structures and objects significant in American history, architecture, archeology and culture maintained by the Secretary of the Interior. Expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 U.S.C. 462) and Section 101(a)(1) (A) of the National Historic Preservation Act.

natural gas - Combustible gases (such as hydrocarbons) or mixtures of combustible gases and non-combustible gases (such as helium) which are in a gaseous phase at atmospheric conditions of temperature and pressure.

NEPA process - All measures necessary for compliance with the National Environmental Policy Act of 1969 (see 40 CFR 1508.21).

no action alternative - An alternative where no activity would occur. The development of a no action alternative is required by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The no action alternative provides a baseline for estimating the effects of other alternatives.

outcrop -A rock formation that appears at or near the surface; the intersection of a rock formation with the surface.

overburden - Material of any nature, consolidated or unconsolidated, that overlies a coal or other useful mineral deposit, excluding topsoil.

paleontological resource - A site containing evidence of plant or non-human animal life of past geological periods, usually in the form of fossil remains.

peak discharge or flow - The highest discharge of water recorded over a specified period of time at a given stream location; also called maximum flow. Often thought of in terms of spring snowmelt, summer, fall or winter rainy season flows.

perennial species (vegetation) - Vegetation that lives over from season to season.

perennial stream - A stream or part of a stream that flows continuously during the calendar year as a result of groundwater discharge or surface runoff.

permeability - The ability of rock or soil to transmit a fluid.

permit application package - A proposal to conduct surface coal mining and reclamation operations on federal lands, including an application for a permit, permit revision, or permit renewal and all the information required by SMCRA, the applicable state program, any applicable cooperative agreement, and all other applicable laws and regulations including, with respect to federal leased coal, the Mineral Leasing Act and its implementing regulations.

permit area - The area of land, indicated on the approved map submitted by the operator with his or her application, required to be covered by the operator's performance bond under the regulations at 30 CFR Part 800 and which shall include the area of land upon which the operator proposes to conduct surface coal mining and reclamation operations under the permit, including all disturbed areas (see 30 CFR 701.5).

physiography - Physical geography.

piezometer - A well, generally of small diameter, that is used to measure the elevation of the water table.

playa - The sandy, salty, or mud-caked flat floor of a basin with interior drainage, usually occupied by a shallow ephemeral lake during or after rain or snow storms.

point source (pollution) - A point at which pollution is added to a system, either instantaneously or continuously. An example is a smokestack.

pore volume - the amount of fluid necessary to fill the void space in an unsaturated porus medium (i.e., mine backfill).

porosity - The percentage of the bulk volume of rock, sediment or soil that is not occupied by sediment or soil particles; the void space in rock or sediment. It may be isolated or connected.

postmining topography - The relief and contour of the land that remains after mining has been completed.

potentiometric surface - The surface that coincides with the static level of water in an aquifer. The surface is represented by the levels to which water from a given aquifer will rise under its full hydrologic head.

predator - An animal that obtains food by killing and consuming other animals.

prime or unique farmland - Those lands which are defined by the Secretary of Agriculture in 7 CFR part 657 (*Federal Register* Vol. 4 No. 21) and which have historically been used for cropland (see 30 CFR 701.5).

proposed action - In terms of National Environmental Policy Act, the project, activity, or action that a federal agency proposes to implement or undertake and which is the subject of an environmental analysis.

qualified surface owner - the natural person or persons (or corporation, the majority stock of which is held by a person or persons otherwise meeting the requirements of this section) who:

(1) Hold legal or equitable title to the surface of split estate lands;

(2) Have their principal place of residence on the land, or personally conduct farming or ranching operations upon a farm or ranch unit to be affected by surface mining operations; or received directly a significant portion of their income, if any, from such farming and ranching operations; and

(3) have met the conditions of (1) and (2) above for a period of at least three years, except for persons who gave written consent less than three years after they met the requirements of both (1) and (2) above [see 43 CFR 3400.0-5(gg)].

raptor - Bird of prey, such as an eagle, falcon, hawk, owl, or vulture.

recharge - The processes by which groundwater is absorbed into a zone of saturation.

reclamation - Rehabilitation of a disturbed area to make it acceptable for designated uses. This normally involves regrading, replacement of topsoil, revegetation and other work necessary to restore the disturbed area for post-mining use.

record of decision (ROD) - A document separate from, but associated with, an environmental impact statement that publicly and officially discloses the responsible official's decision on the proposed action (see 40 CFR 1505.2).

recoverable coal- The amount of coal that can actually be recovered for sale from the demonstrated coal reserve base.

rental payment - Annual payment from a lessee to a lessor to maintain the lessee's mineral lease rights.

resource management plan (RMP) - A land use plan, as prescribed by FLPMA, that directs the use and allocation of public lands and resources managed by BLM. Prior to selection of the RMP, different alternative management plans are compared and evaluated in an environmental impact statement (EIS) to determine which plan will best direct the management of the public lands and resources.

revegetation - The reestablishment and development of self-sustaining plant cover following land disturbance. This may occur through natural processes, or the natural processes may be enhanced by human assistance through seedbed preparation, reseeding, and mulching.

right of way (ROW) - The right to pass over property owned by another. The strip of land over which facilities such as roadways, railroads, or power lines are built.

riparian - The area adjacent to rivers and streams that lies between the stream channel and upland terrain and that supports specific vegetation influenced by perennial and/or intermittent water.

royalty (mineral) - A share of production that is free of the expense of production. It is generally paid by a lessee to a lessor of a mineral lease as part of the terms of the lease.

runoff - That portion of rainfall that is not absorbed; it may be used by vegetation, lost by evaporation, or it may find its way into streams as surface flow.

salinity - Refers to the solids, such as sodium chloride (table salt) and alkali metals, that are dissolved in water. Often in non saltwater areas, total dissolved solids is used as an equivalent term.

sandstone - A common sedimentary rock primarily composed of sand grains, mainly quartz, that are cemented together by other mineral material.

scoping - A public informational process required by the National Environmental Policy Act to determine private and public concerns, scope of issues, and/or questions regarding a proposed action to be evaluated in an environmental impact analysis.

scoria (clinker) - Baked and fused rock resulting from in-place burning of coal deposits.

sedimentation pond - An impoundment used to remove solids from water in order to meet water quality standards or effluent limitations before the water leaves the permit area (see 30 CFR 701.5).

semi-arid - A climate or region characterized by little yearly rainfall and by the growth of a number of short grasses and shrubs.

severance tax - A tax on the removal of minerals from the ground.

shale - A very fine-grained clastic rock or sediment consisting predominately of clay-sized particles that is laminated; lithified, layered mud.

significant impact - A qualitative term used to describe the anticipated importance of impacts to the human environment as a result of an action.

siltstone - A fine-grained clastic rock consisting predominately of silt-sized particles.

socioeconomics - The social and economic situation that might be affected by a proposed action.

soil survey - The systematic examination, description, classification, and mapping of soils in an area, usually a county. Soil surveys are classified according to the level of detail of field examination. Order I is the most detailed and Order V is the least detailed.

spontaneous combustion - The heating and slow combustion of coal and coaly material initiated by the absorption of oxygen.

stipulations - Requirements that are part of the terms of a mineral lease. Some stipulations are standard on all Federal leases. Other stipulations may be applied to specific leases at the discretion of the surface management agency to protect valuable surface resources or uses existing on those leases.

storage coefficient - The volume of water that can be released from storage per unit surface area of a saturated confined aquifer, per unit decline in the component of hydraulic head normal to the surface. It is calculated by taking the product of the specific storage and the aquifer thickness.

stratigraphic - Of, relating to, or determined by stratigraphy, which is the branch of geology dealing with the study of the nature, distribution, and relations of layered rocks in the earth's crust.

stripping ratio - The unit amount of overburden that must be removed to gain access to a similar unit amount of coal.

subirrigation - In alluvial valley floors, the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (see 30 CFR 701.5).

subbituminous -A lower rank of coal (35-45% carbon) with a heating value between that of bituminous and lignite, usually 8,300-11,500 Btu per pound. Subbituminous coal contains a high percentage of volatile matter and moisture.

surface disturbance - Any disturbance by mechanical actions which alters the soil surface.

surface rights - Rights to the surface of the land, does not include rights to oil, gas, or other subsurface minerals or subsurface rights.

suspended solids - The very fine soil particles which remain in suspension in water for a considerable period of time without contact with the stream or river channel bottom.

tectonic fracture - Fractures caused by deformation of the earth's crust.

threatened and endangered (T&E) species - These species of plants or animals classified as threatened or endangered pursuant to section 4 of the Endangered Species Act. Any species which is in danger of extinction, or is likely to become so within the foreseeable future.

> ***Category 1*** - Substantial biological information on file to support the appropriateness of proposing to list as endangered or threatened.
> ***Category 2*** - Current information indicates that proposing to list as endangered or threatened is possibly appropriate, but substantial biological information is not on file to support an immediate ruling (U.S. Fish and Wildlife Service).

topography - Physical shape of the ground surface; the configuration of land surface including its relief, elevation, and the position of its natural and manmade features.

topsoil - The surface layer of a soil.

total dissolved solids (TDS) - The total quantity in milligrams per liter of dissolved materials in water.

transmissivity - The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Equals the hydraulic conductivity multiplied by the aquifer thickness. Values are given in units of gallons per day per foot.

transpiration - The discharge of water vapor by plants.

truck & shovel - A mining method used to remove overburden and coal in a strip mining operation. Truck and shovel operations use large bucket-equipped digging and loading machines (shovels) and large dump trucks to remove overburden instead of using a dragline for overburden removal.

typic - Typical.

unconfined aquifer - an aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

unsuitability criteria - The 20 criteria described in 43 CFR 3461, the application of which results in an assessment of federal coal lands as suitable or unsuitable for surface coal mining.

uranium - A very hard, heavy, metallic element that is crucial to development of atomic energy.

vegetation type - A kind of existing plant community with distinguishable characteristics described in terms of the present vegetation that dominates an area.

vertebrate fossils - The remains of animals that possessed a backbone; examples are fish, amphibians, reptiles, dinosaurs, birds, and mammals.

vesicular - Rock containing many small cavities which were formed by the expansion of a bubble of gas or steam during the solidification of the rock.

visual resources - The physical features of a landscape which can be seen (e.g., land, water, vegetation, structures, and other features).

Visual Resource Management (VRM) - The systematic means to identify visual values, establish objectives which provide the standards for managing those values, and evaluate the visual impacts of proposed projects to ensure that objectives are met.

volatile matter - In coal, those substances, other than moisture, that are given off as gas or vapor during combustion.

waterfowl - A bird that frequents water, especially a swimming bird.

wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient, under normal circumstances, to support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands include marshes, bogs, sloughs, potholes, river overflows, mud flats, wet meadows, seeps, and springs [see 33 CFR 328.3(a)(7)(b)].

wild and scenic river - Rivers or sections of rivers designated by Congressional actions under the 1968 Wild and Scenic Rivers Act as wild, scenic, or recreational by an act of the Legislature of the state or states through which they flow. Wild and scenic rivers may be classified and administered under one or more of the following categories:

> **wild river areas** - Rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.
>
> **scenic river areas** - Rivers or sections of rivers that are free of impoundments, with watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.
>
> **recreational river areas** - Rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

wilderness - An area of undeveloped Federal land designated wilderness by Congress, retaining its primeval character and influence, without permanent improvements or human habitation, protected and managed to preserve its natural conditions and that (1) generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable, (2) has outstanding opportunities for solitude or primitive and unconfined recreation, (3) has at least 5,000 acres or is of sufficient size to make practical its preservation and use in an unimpaired condition, and (4) also may contain features that are of ecological, geological, scientific, educational, scenic, or historical value. These characteristics were identified by Congress in the Wilderness Act of 1964.

APPENDIX A

FEDERAL AND STATE PERMITTING REQUIREMENTS AND AGENCIES

APPENDIX A:
FEDERAL AND STATE AGENCIES & PERMITTING REQUIREMENTS

Agency	Lease/Permit/Action
FEDERAL	
Bureau of Land Management	Coal Lease Resource Recovery & Protection Plan Scoria Sales Contract Exploration Drilling Permit
Office of Surface Mining Reclamation and Enforcement	Preparation of Mining Plan Approval Document SMCRA Oversight
Office of the Secretary of the Interior	Approval of Mining Plan
Mine Safety and Health Administration	Safety Permit and Legal ID Ground Control Plan Major Impoundments Explosives Use and Storage Permit
Bureau of Alcohol, Tobacco, and Firearms	Explosive's Manufacturer's License Explosives Use and Storage Permit
Federal Communication Commission	Radio Permit: Ambulance Mobile Relay System Radio License
Nuclear Regulatory Commission	Radioactive By-Products Material License
Army Corps of Engineers	Authorization of Impacts to Wetlands and Other Waters of the U.S.
Department of Transportation	Hazardous Waste Shipment Notification
Federal Aviation Administration	Radio Tower Permits
STATE	
State Land Commission	Coal Lease Scoria Lease
Department of Environmental Quality-Land Quality Division	Permit and License to Mine
Department of Environmental Quality-Air Quality Division	Air Quality Permit to Operate Air Quality Permit to Construct
Department of Environmental Quality-Water Quality Division	National Pollutant Discharge Elimination System Water Discharge Permit Permit to Construct Sedimentation Pond Authorization to Construct Septic Tank & Leach Field Authorization to Construct and Install a Public Water Supply and Sewage Treatment System
Department of Environmental Quality-Solid Waste Management Program	Solid Waste Disposal Permit-Permanent and Construction
State Engineer's Office	Appropriation of Surface Water Permits Appropriation of Ground Water Permits
Industrial Siting Council	Industrial Siting Certificate of Non-Jurisdiction
Department of Health	Radioactive Material Certificate of Registration

APPENDIX B

UNSUITABILITY CRITERIA FOR THE NORTH JACOBS RANCH LBA TRACT

Appendix B. Unsuitability Criteria for the North Jacobs Ranch LBA Tract

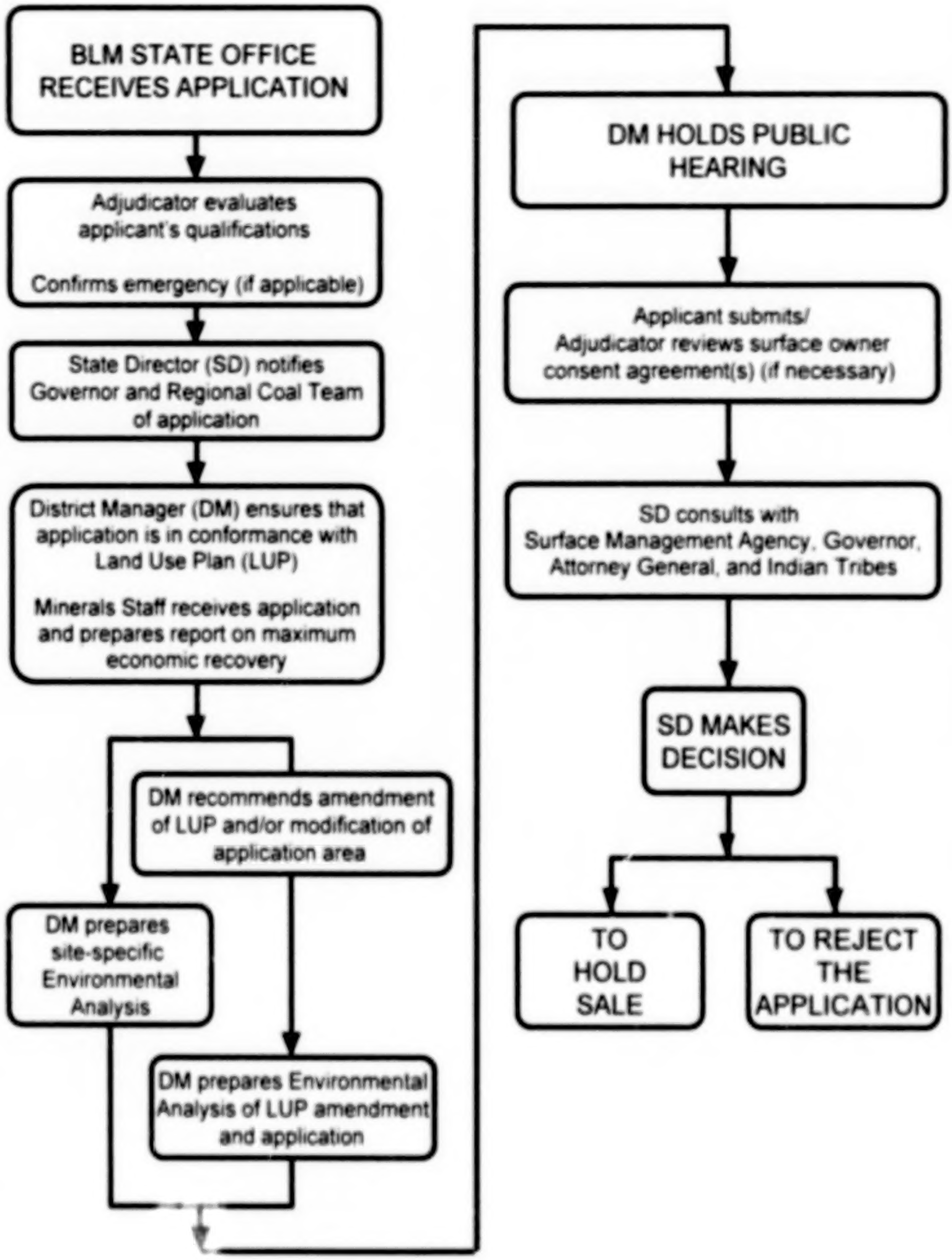
UNSUITABILITY CRITERIA	GENERAL FINDINGS FOR BLM BUFFALO RESOURCE AREA (BLM 1985) and TBNG (USFS 1985)	VALIDATION FOR NORTH JACOBS RANCH LBA TRACT
1. Federal Land Systems. With certain exceptions that do not apply to this tract, all federal lands included in the following systems are unsuitable for mining: National Parks, National Wildlife Refuges, National System of Trails, National Wilderness Preservation System, National Wild and Scenic Rivers, National Recreation Areas, Lands Acquired through the Land and Water Conservation Fund, National Forests and federal lands in incorporated cities, towns and villages.	None of the listed federal lands categories are present within the study area. TBNG is not part of a national forest, and no TBNG lands are included in the North Jacobs Ranch Tract.	None of the listed federal lands are present on the North Jacobs Ranch LBA Tract, and the tract therefore is not unsuitable for mining.
2. Rights-Of-Way and Easements. Federal lands that are within rights-of-way or easements or within surface leases for residential, commercial, industrial or other public purposes, on federally owned surface, are unsuitable for mining.	The general area contains two rights-of-way that meet the intent of this criterion: BN-UP railroad and the Tri-County 230 Kv transmission line.	Neither the Tri-County 230 Kv transmission line nor the BN-UP right-of-way are on the LBA tract, and the tract therefore is not unsuitable for mining.
3. Dwellings, Roads, Cemeteries, and Public Buildings. Federal lands within 100 feet of a right-of-way of a public road or a cemetery, or within 300 feet of any public building, school, church, community or institutional building or public park, or within 300 feet of an occupied dwelling are unsuitable for mining.	The regional RMP lists a school at Wilkinson Ranch headquarters, Wyoming State Highway 59, and 5 ranch headquarters that meet the intent of this criterion.	None of the listed rights-of-way or buildings are on the LBA Tract, and the tract therefore is not unsuitable for mining.
4. Wilderness Study Areas. Federal lands designated as wilderness study areas are unsuitable for mining while under review for possible wilderness designation.	No lands in the general review area are within a wilderness study area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
5. Lands with Outstanding Scenic Quality. Scenic federal lands designated by visual resource management analysis as Class I (outstanding visual quality or high visual sensitivity) but not currently on National Register of Natural Landmarks are unsuitable.	No lands in Campbell County meet the scenic criteria as outlined.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
6. Land Used for Scientific Study. Federal lands under permit by the surface management agency and being used for scientific studies involving food or fiber production, natural resources, or technology demonstrations and experiments are unsuitable for the duration of the study except where mining would not jeopardize the purpose of the study.	No lands in the general review area are under permit except small enclosures being used to gage reclamation success on existing mines.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
7. Historic Lands and Sites. All publicly or privately owned places which are included in or are eligible for inclusion in the National Register of Historic Places and an appropriate buffer zone are unsuitable.	On the basis of the consultation with the State Historic Preservation Office, there were no unsuitable findings under this criterion in the general review area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
8. Natural Areas. Federal lands designated as natural areas or National Natural Landmarks are unsuitable.	No lands in the general review area are designated as natural areas or as National Natural Landmarks.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
9. Critical Habitat for Threatened or Endangered Plant and Animal Species. Federally designated critical habitat for T or E plant and animal species, and scientifically documented essential habitat for T or E species are unsuitable.	There is no habitat meeting federally designated criteria for T or E plant or animal species within the general review area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
10. State Listed Species. Federal lands containing habitat determined to be critical or essential for plant or animal species listed by a state pursuant to state law as T or E shall be considered unsuitable.	Wyoming does not maintain a state list of T or E species of plants or animals. Therefore, this criterion does not apply.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.

UNSUITABILITY CRITERIA	GENERAL FINDINGS FOR BLM BUFFALO RESOURCE AREA (BLM 1985) and TBNG (USFS 1985)	VALIDATION FOR NORTH JACOBS RANCH LBA TRACT
11. Bald or Golden Eagle Nests. An active bald or golden eagle nest and appropriate buffer zone are unsuitable unless the lease can be conditioned so that eagles will not be disturbed during breeding season or unless golden eagle nests will be moved.	The USFS found numerous eagle nests, and buffer zones were established. It was determined that coal leasing can occur within the buffer zone if the nests are protected with stipulations and site mitigation plans. There were no unsuitable findings under this criterion, but lands involved in buffer zones are subject to special lease stipulations.	No active eagle nests are found on the tract. There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
12. Bald and Golden Eagle Roost and Concentration Areas. Bald and golden eagle roost and concentration areas on federal lands used during migration and wintering are unsuitable unless mining can be conducted in such a way as to ensure that eagles shall not be adversely disturbed.	No golden eagle roost or concentration areas occur in the general review area. Mining planned in the review area is not likely to jeopardize the continued existence of the bald eagle. Coal leasing can occur and adequate protection can be provided. There were no unsuitable findings in the general review area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
13. Federal lands containing active falcon (excluding kestrel) cliff nesting sites and a suitable buffer zone shall be considered unsuitable unless mining can be conducted in such a way as to insure the falcons will not be adversely affected.	After consultation with USFWS, it was determined that this criterion does not apply in TBNG and the general area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
14. Habitat for Migratory Bird Species. Federal lands which are high priority habitat for migratory bird species of high federal interest shall be considered unsuitable unless mining can be conducted in such a way as to ensure that migratory bird habitat will not be adversely affected during the period it is in use.	After consultation with USFWS, it was determined that this criterion does not apply in TBNG.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
15. Fish and Wildlife Habitat for Resident Species. Federal lands which the surface management agency and state jointly agree are fish and wildlife habitat of resident species of high interest to the state, and which are essential for maintaining these priority wildlife species, shall be considered unsuitable.	Sage grouse leks were found on and near the TBNG review area. However, methods of mining can be developed which will not have a significant long-term impact on the grouse or their habitat. Therefore, the areas involved in leks and buffer zones are not unsuitable.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
16. Floodplains. Federal lands in riverine, coastal, and special floodplains shall be considered unsuitable where it is determined that mining could not be undertaken without substantial threat of loss of life or property.	After consultation with the USGS, it was determined that floodplains can be mined with site specific stipulations and resource protection safeguards to be developed during mining and reclamation planning. Therefore, all lands within the general review area are not unsuitable for mining.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
17. Municipal Watersheds. Federal lands which have been committed by the surface management agency to use as municipal watersheds shall be considered unsuitable.	There are no municipal watersheds in the general review area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
18. National Resource Waters. Federal lands with national resource waters, as identified by states in their water quality management plans, and 1/4-mile buffer zones shall be unsuitable.	There are no national resource waters within the TBNG review area.	There are no unsuitable findings, and the North Jacobs Ranch LBA Tract therefore is not unsuitable for mining.
19. Alluvial Valley Floors. All lands identified by the surface management agency, in consultation with the state, as AVFs where mining would interrupt, discontinue or preclude farming, are unsuitable. Additionally, when mining federal lands outside an AVF would materially damage the quality or quantity of water in surface or underground water systems that would supply AVFs, the land shall be considered unsuitable.	Lands along prominent drainages were considered potential AVFs pending a final determination by the state. These lands are placed in an "available pending further study" category and are not considered unsuitable.	The State will make a final determination during the mine permit application review process. No heretofore undisturbed stream valleys are included in the LBA tract, and there is no unsuitability finding.
20. State or Indian Tribe Criteria. Federal lands to which is applicable a criterion proposed by the state or Indian tribe located in the planning area and adopted by rulemaking by the Secretary are unsuitable.	The state has no applicable criteria and there is no Indian tribe located in or near the planning area. Therefore there is no unsuitability finding.	There are no unsuitability findings for this criterion on the LBA tract.

APPENDIX C

COAL LEASE-BY-APPLICATION
FLOW CHART

COAL LEASE-BY-APPLICATION


BLM STATE OFFICE RECEIVES APPLICATION
Adjudicator evaluates applicant's qualifications
Confirms emergency (if applicable)
State Director (SD) notifies Governor and Regional Coal Team of application
District Manager (DM) ensures that application is in conformance with Land Use Plan (LUP)
Minerals Staff receives application and prepares report on maximum economic recovery
DM recommends amendment of LUP and/or modification of application area
DM prepares site-specific Environmental Analysis
DM prepares Environmental Analysis of LUP amendment and application
DM HOLDS PUBLIC HEARING
Applicant submits/ Adjudicator reviews surface owner consent agreement(s) (if necessary)
SD consults with Surface Management Agency, Governor, Attorney General, and Indian Tribes
SD MAKES DECISION
TO HOLD SALE
TO REJECT THE APPLICATION

APPENDIX D

BLM SPECIAL COAL LEASE STIPULATIONS
AND
FORM 3400-12 COAL LEASE

SPECIAL STIPULATIONS

In addition to observing the general obligations and standards of performance set out in the current regulations, the lessee shall comply with and be bound by the following special stipulations.

These stipulations are also imposed upon the lessee's agents and employees. The failure or refusal of any of these persons to comply with these stipulations shall be deemed a failure of the lessee to comply with the terms of the lease. The lessee shall require his agents, contractors and subcontractors involved in activities concerning this lease to include these stipulations in the contracts between and among them. These stipulations may be revised or amended, in writing, by the mutual consent of the lessor and the lessee at any time to adjust to changed conditions or to correct an oversight.

(a) ***CULTURAL RESOURCES*** -

(1) Before undertaking any activities that may disturb the surface of the leased lands, the lessee shall conduct a cultural resource intensive field inventory in a manner specified by the Authorized Officer of the BLM or of the surface managing agency, if different, on portions of the mine plan area and adjacent areas, or exploration plan area, that may be adversely affected by lease-related activities and which were not previously inventoried at such a level of intensity. The inventory shall be conducted by a qualified professional cultural resource specialist (i.e., archeologist, historian, historical architect, as appropriate), approved by the Authorized Officer of the surface managing agency (BLM, if the surface is privately owned), and a report of the inventory and recommendations for protecting any cultural resources identified shall be submitted to the Assistant Director of the Western Support Center of the Office of Surface Mining, the Authorized Officer of the BLM, if activities are associated with coal exploration outside an approved mining permit area (hereinafter called Authorized Officer), and the Authorized Officer of the surface managing agency, if different. The lessee shall undertake measures, in accordance with instructions from the Assistant Director, or Authorized Officer, to protect cultural resources on the leased lands. The lessee shall not commence the surface disturbing activities until permission to proceed is given by the Assistant Director or Authorized Officer.

(2) The lessee shall protect all cultural resource properties within the lease area from lease-related activities until the cultural resource mitigation measures can be implemented as part of an approved mining and reclamation or exploration plan.

(3) The cost of conducting the inventory, preparing reports, and carrying out mitigation measures shall be borne by the lessee.

(4) If cultural resources are discovered during operations under this lease, the lessee shall immediately bring them to the attention of the Assistant Director or Authorized Officer, or the Authorized Officer of the surface managing agency, if the Assistant Director is not available. The lessee shall not disturb such resources except as may

be subsequently authorized by the Assistant Director or Authorized Officer.

Within two (2) working days of notification, the Assistant Director or Authorized Officer will evaluate or have evaluated any cultural resources discovered and will determine if any action may be required to protect or preserve such discoveries. The cost of data recovery for cultural resources discovered during lease operations shall be borne by the surface managing agency unless otherwise specified by the Authorized Officer of the BLM or of the surface managing agency, if different.

(5) All cultural resources shall remain under the jurisdiction of the United States until ownership is determined under applicable law.

(b) ***PALEONTOLOGICAL RESOURCES*** - If paleontological resources, either large and conspicuous, and/or of significant scientific value are discovered during construction, the find will be reported to the Authorized Officer immediately. Construction will be suspended within 250 feet of said find. An evaluation of the paleontological discovery will be made by a BLM approved professional paleontologist within five (5) working days, weather permitting, to determine the appropriate action(s) to prevent the potential loss of any significant paleontological value. Operations within 250 feet of such discovery will not be resumed until written authorization to proceed is issued by the Authorized Officer. The lessee will bear the cost of any required paleontological appraisals, surface collection of fossils, or salvage of any large conspicuous fossils of significant scientific interest discovered during the operations.

(c) ***THREATENED, ENDANGERED, CANDIDATE, or OTHER SPECIAL STATUS PLANT and ANIMAL SPECIES*** - The lease area may contain habitat for the following threatened, endangered, candidate, or other special status plant and animal species: black-footed ferret, bald eagle, mountain plover, Ute Ladies'-tresses, swift fox, sturgeon chub, and black-tailed prairie dog. If surveys performed during the permit application process or future permit revisions indicate that any threatened, endangered, candidate, or other special status plant/animal species could be impacted by proposed coal mining and reclamation operations located on this lease and the potential impacts to that species cannot be satisfactorily resolved through coordination with the U.S. Fish and Wildlife Service (USFWS), the proposed coal mining and reclamation operations could be restricted or constrained by the State regulatory authority.

(d) ***MULTIPLE MINERAL DEVELOPMENT*** - Operations will not be approved which, in the opinion of the Authorized Officer, would unreasonably interfere with the orderly development and/or production from a valid existing mineral lease issued prior to this one for the same lands.

(e) ***OIL AND GAS/COAL RESOURCES*** - The BLM realizes that coal mining operations conducted on Federal coal leases issued within producing oil and gas fields may interfere with the economic recovery of oil and gas; just as Federal oil and gas leases issued in a Federal coal lease area may inhibit coal recovery. BLM retains the authority to alter and/or modify the resource recovery and protection plans for coal operations and/or oil and gas operations on those lands covered by Federal mineral leases so as to obtain maximum resource recovery.

(f) ***RESOURCE RECOVERY AND PROTECTION*** - Notwithstanding the approval of a resource recovery and protection plan (R2P2) by the BLM, lessor reserves the right to seek damages against the operator/lessee in the event (i) the operator/lessee fails to achieve maximum economic recovery (MER) (as defined at 43 CFR 3480.0-5(21)) of the recoverable coal reserves or (ii) the operator/lessee is determined to have caused a wasting of recoverable coal reserves. Damages shall be measured on the basis of the royalty that would have been payable on the wasted or unrecovered coal.

The parties recognize that under an approved R2P2, conditions may require a modification by the operator/lessee of that plan. In the event a coal bed or portion thereof is not to be mined or is rendered unmineable by the operation, the operator/lessee shall submit appropriate justification to obtain approval by the Authorized Officer to leave such reserves unmined. Upon approval by the Authorized Officer, such coal beds or portions thereof shall not be subject to damages as described above. Further, nothing in this section shall prevent the operator/lessee from exercising its right to relinquish all or portion of the lease as authorized by statute and regulation.

In the event the Authorized Officer determines that the R2P2, as approved, will not attain MER as the result of changed conditions, the Authorized Officer will give proper notice to the operator/lessee as required under applicable regulations. The Authorized Officer will order a modification if necessary, identifying additional reserves to be mined in order to attain MER. Upon a final administrative or judicial ruling upholding such an ordered modification, any reserves left unmined (wasted) under that plan will be subject to damages as described in the first paragraph under this section.

Subject to the right to appeal hereinafter set forth, payment of the value of the royalty on such unmined recoverable coal reserves shall become due and payable upon determination by the Authorized Officer that the coal reserves have been rendered unmineable or at such time that the operator/lessee has demonstrated an unwillingness to extract the coal.

The BLM may enforce this provision either by issuing a written decision requiring payment of the MMS demand for such royalties, or by issuing a notice of non-compliance. A decision or notice of non-compliance issued by the lessor that payment is due under this stipulation is appealable as allowed by law.

(g) ***PUBLIC LAND SURVEY PROTECTION*** - The lessee will protect all survey monuments, witness corners, reference monuments, and bearing trees against destruction, obliteration, or damage during operations on the lease areas. If any monuments, corners or accessories are destroyed, obliterated, or damaged by this operation, the lessee will hire an appropriate county surveyor or registered land surveyor to reestablish or restore the monuments, corners, or accessories at the same location, using surveying procedures in accordance with the "Manual of Surveying Instructions for the Survey of the Public Lands of the United States." The survey will be recorded in the appropriate county records, with a copy sent to the Authorized Officer.

(h) ***RAILROAD RIGHT-OF-WAY*** - No mining activity of any kind may be conducted within the Burlington Northern/Chicago and Northwestern railroad right-of-way. The lessee shall recover all legally and economically recoverable coal from all leased lands not within the foregoing right-of-way. Lessee shall pay all royalties on any legally and economically recoverable coal which it fails to mines without the written permission of the Authorized Officer.

APPENDIX E

Non-Mine Groundwater and Surface Water Rights Within and Adjacent to the North Jacobs Ranch LBA Tract

GROUNDWATER RIGHTS

Permit No.	Priority	Twn	Rng	Sec	QQ	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
29 1 107W	02/07/00	43	71	13	SESE	BARRETT RESOURCES CORPORATION	Hopkins Trust 44-13-4371	UNA	CBM		
29 1 165W	02/28/00	43	71	1	NWNE	RIM OPERATING, INC	CBM C #31-01	UNA	STO,CBM		
29 1 32W	01/19/00	44	71	15	NWNW	BARRETT RESOURCES CORP	MILLS 11-15-4471	UNA	CBM		
29 10 102W	02/07/00	43	71	14	SWNW	BARRETT RESOURCES CORPORATION	Revland Trust 12-14-4371	UNA	CBM		
29 10 164W	02/28/00	44	71	25	NWSW	RIM OPERATING, INC	CBM C #13-25	UNA	STO,CBM		
29 10 31W	01/19/00	44	71	10	SESE	BARRETT RESOURCES CORP	BOLLER MILLS 44-10-4471	UNA	CBM		
29 2 105W	02/07/00	43	71	13	NWSE	BARRETT RESOURCES CORPORATION	Arch 33-13-4371	UNA	CBM		
29 2 32W	01/19/00	44	71	15	SENW	BARRETT RESOURCES CORP	MILLS 22-15-4471	UNA	CBM		
29 3 32W	01/19/00	44	71	15	SWNE	BARRETT RESOURCES CORP	MILLS 32-15-4471	UNA	CBM		
29 4 32W	01/19/00	44	71	15	NENE	BARRETT RESOURCES CORP	MILLS 41-15-4471	UNA	CBM		
29 5 164W	02/28/00	44	71	24	NWNW	RIM OPERATING, INC	CBM C #11-24	UNA	STO,CBM		
29 6 164W	02/28/00	44	71	23	SESE	RIM OPERATING, INC	CBM C #44-23	UNA	STO,CBM		
29 6 176W	03/06/00	44	71	25	SESW	RIM OPERATING, INC	CBM C #24-25	UNA	STO,CBM		
29 6 32W	01/19/00	44	71	16	NENW	BARRETT RESOURCES CORP	STATE 21-16-4471	UNA	CBM		
29 7 164W	02/28/00	44	71	23	SENE	RIM OPERATING, INC	CBM C #42-23	UNA	STO,CBM		
29 7 176W	03/06/00	44	71	24	SESW	RIM OPERATING, INC	CBM C - '4-24	UNA	STO,CBM		
29 7 32W	01/19/00	44	71	16	SWNE	BARRETT RESOURCES CORP	STATE 32-16-4471	UNA	CBM		
29 8 102W	02/07/00	43	71	14	NENW	BARRETT RESOURCES CORPORATION	Revland Trust 21-14-4371	UNA	CBM		
29 8 164W	02/28/00	44	71	24	NWSW	RIM OPERATING, INC	CBM C #13-24	UNA	STO,CBM		
29 8 176W	03/06/00	44	71	25	SENW	RIM OPERATING, INC	CBM C #22-25	UNA	STO,CBM		
29 8 32W	01/19/00	44	71	16	NENE	BARRETT RESOURCES CORP	STATE 41-16-4471	UNA	CBM		
29 9 164W	02/28/00	44	71	25	NWNW	RIM OPERATING, INC	CBM C #11-25	UNA	STO,CBM		
29 9 31W	01/19/00	44	71	10	NWSE	BARRETT RESOURCES CORP	BOLLER MILLS 33-10-4471	UNA	CBM		
29 9 32W	01/19/00	44	71	16	NESE	BARRETT RESOURCES CORP	STATE 43-16-4471	UNA	CBM		
P103392W	08/15/96	44	70	28	NWNE	JACOBS LAND AND LIVESTOCK	REYNOLDS #1	UNA	STO	5	36
P104071W	09/01/71	44	70	19	SWNW	DALE MILLS	MILLS JOHNSTON #1		STO	7.5	19
P106972W	08/01/97	44	71	14	NESE	BARRETT RESOURCES CORP	DURHAM RANCH FED 43-14A	UNA	MON	0	82
P107682	07/28/97	43	71	9	NENE	BARRETT RESOURCES CORP	STUART 1-01-0	UNA	MIS	35	54
P107765W	10/06/97	44	71	12	NWSW	RIM OPERATING, INC	CBM C #13-12	UNA	MIS		
P107766W	10/06/97	44	71	12	SENW	RIM OPERATING, INC	CBM C #22-12	UNA	MIS		
P107767W	10/06/97	44	71	12	SESW	RIM OPERATING, INC	CBM C #24-12	UNA	MIS		
P107768W	10/06/97	44	71	12	NWSE	RIM OPERATING, INC	CBM C #33-12	UNA	MIS		
P107769W	10/06/97	44	71	12	SESE	RIM OPERATING, INC	CBM C #44-12	UNA	MIS		
P107770W	10/06/97	44	71	13	NWNW	RIM OPERATING, INC	CBM C #11-13	UNA	MIS		
P107771W	10/06/97	44	71	13	SENW	RIM OPERATING, INC	CBM C #22-13	UNA	MIS		
P107772W	10/06/97	44	71	13	NWNE	RIM OPERATING, INC	CBM C #31-13	UNA	MIS		
P107773W	10/06/97	44	71	13	SWNE	RIM OPERATING, INC	CBM C #32-13	UNA	MIS		
P107774W	10/06/97	44	71	13	NWSE	RIM OPERATING, INC	CBM C #33-13	UNA	MIS		
P107775W	10/06/97	44	71	13	SENE	RIM OPERATING, INC	CBM C #42-13	UNA	MIS		
P110011W	10/27/71	44	71	12	NWNW	INEXCO OIL CO	CENTRAL WSW #5 1	ADJ	IND	300	511
P110012W	10/27/71	44	70	7	NWNW	INEXCO OIL CO	CENTRAL WSW #5 2	ADJ	IND	150	454
P110013W	10/27/71	44	70	7	NWNW	INEXCO OIL CO	CENTRAL WSW #5 3	CAN	IND		

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GROUNDWATER RIGHTS

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P112580W	10/30/98	43	71	13	NWNW	BARRETT RESOURCES CORP	YOUNG 11-13	UNA	CBM	29	410
P115199W	04/16/99	43	71	9	NENE	BARRETT RESOURCES CORP	ENL STUART FED 1-41-9	UNA	CBM	50	540
P115398W	04/22/99	44	71	11	SWSW	WILLIAM ELAINE PRIDGEON	PRIDGEON #1	UNA	STO	10	174
P118161W	08/06/99	43	71	4	SESW	BARRETT RESOURCES CORP	Stuart 24-4	UNA	CBM		
P118162W	08/06/99	43	71	4	NWSE	BARRETT RESOURCES CORP	Stuart 33-4	UNA	CBM		
P118163W	08/06/99	43	71	4	SESE	BARRETT RESOURCES CORP	Stuart 44-4	UNA	CBM		
P118169W	08/06/99	43	71	10	NESW	BARRETT RESOURCES CORP	Stuart 23-10	UNA	CBM		
P118170W	08/06/99	44	71	28	SWSW	BARRETT RESOURCES CORP	Stuart 14-28	UNA	CBM		
P118171W	08/06/99	44	71	28	NESW	BARRETT RESOURCES CORP	Stuart 21-28	UNA	CBM		
P118176W	08/06/99	44	71	33	SWNW	BARRETT RESOURCES CORP	Stuart 12-33	UNA	CBM		
P118177W	08/06/99	44	71	33	SWSW	BARRETT RESOURCES CORP.	Stuart 14-33	UNA	CBM		
P118178W	08/06/99	44	71	33	NENW	BARRETT RESOURCES CORP	Stuart 21-33	UNA	CBM		
P118179W	08/06/99	44	71	33	NESW	BARRETT RESOURCES CORP	Stuart 23-33	UNA	CBM		
P118180W	08/06/99	44	71	33	SWNE	BARRETT RESOURCES CORP	Stuart 32-33	UNA	CBM		
P118181W	08/06/99	44	71	33	SWSE	BARRETT RESOURCES CORP	Stuart 34-33	UNA	CBM		
P118182W	08/06/99	44	71	33	NENE	BARRETT RESOURCES CORP	Stuart 41-33	UNA	CBM		
P118183W	08/06/99	44	71	33	NESE	BARRETT RESOURCES CORP	Stuart 43-33	UNA	CBM		
P118863W	09/01/99	44	71	27	SWSW	BARRETT RESOURCES CORP	Chittenden 14-27	UNA	CBM		
P118864W	09/01/99	44	71	27	NESW	BARRETT RESOURCES CORP	Chittenden 23-27	UNA	CBM		
P118865W	09/01/99	44	71	28	SWSE	BARRETT RESOURCES CORP	Chittenden 34-28	UNA	CBM		
P118866W	09/01/99	44	71	28	NESE	BARRETT RESOURCES CORP	Chittenden 43-28	UNA	CBM		
P120245W	11/01/99	43	71	1	NWSW	RIM OPERATING, INC	CBM D #13-01	UNA	STO,CBM		
P120246W	11/01/99	43	71	1	SESW	RIM OPERATING, INC	CBM D #24-01	UNA	STO,CBM		
P120247W	11/01/99	43	71	1	NWSE	RIM OPERATING, INC	CBM D #33-01	UNA	STO,CBM		
P120248W	11/01/99	43	71	1	SESE	RIM OPERATING, INC	CBM D #44-01	UNA	STO,CBM		
P120249W	11/01/99	43	71	12	NWNW	RIM OPERATING, INC	CBM D #11-12	UNA	STO,CBM		
P120250W	11/01/99	43	71	12	NWSW	RIM OPERATING, INC	CBM D #13-12	UNA	STO,CBM		
P120251W	11/01/99	43	71	12	SENW	RIM OPERATING, INC	CBM D #22-12	UNA	STO,CBM		
P120252W	11/01/99	43	71	12	SESW	RIM OPERATING, INC	CBM D #24-12	UNA	STO,CBM		
P120253W	11/01/99	43	71	12	NWNE	RIM OPERATING, INC	CBM D #31-12	UNA	STO,CBM		
P120254W	11/01/99	43	71	12	NWSE	RIM OPERATING, INC	CBM D #33-12	UNA	STO,CBM		
P120255W	11/01/99	43	71	12	SENE	RIM OPERATING, INC	CBM D #42-12	UNA	STO,CBM		
P120256W	11/01/99	43	71	12	SESE	RIM OPERATING, INC	CBM D #44-12	UNA	STO,CBM		
P120257W	11/01/99	44	70	31	SESW	RIM OPERATING, INC	CBM G #24-31	UNA	STO,CBM		
P120258W	11/01/99	44	70	32	SESE	RIM OPERATING, INC	CBM G #44-32	UNA	STO,CBM		
P120259W	11/01/99	44	70	33	SESW	RIM OPERATING, INC	CBM G #24-33	UNA	STO,CBM		
P120260W	11/01/99	43	70	4	NWNW	RIM OPERATING, INC	CBM H #11-04	UNA	STO,CBM		
P120261W	11/01/99	43	70	4	NWSW	RIM OPERATING, INC	CBM H #13-04	UNA	STO,CBM		
P120262W	11/01/99	43	70	5	NWNW	RIM OPERATING, INC	CBM H #11-05	UNA	STO,CBM		
P120263W	11/01/99	43	70	5	NWSW	RIM OPERATING, INC	CBM H #13-05	UNA	STO,CBM		
P120264W	11/01/99	43	70	5	SESW	RIM OPERATING, INC	CBM H #24-05	UNA	STO,CBM		
P120265W	11/01/99	43	70	5	NWNE	RIM OPERATING, INC	CBM H #31-05	UNA	STO,CBM		

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Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P120266W	11/01/99	43	70	5	NESE	RIM OPERATING, INC	CBM H #33-05	UNA	STO,CBM		
P120267W	11/01/99	43	70	5	SENE	RIM OPERATING, INC	CBM H #42-05	UNA	STO,CBM		
P120268W	11/01/99	43	70	5	SESE	RIM OPERATING, INC	CBM H #44-05	UNA	STO,CBM		
P120269W	11/01/99	43	70	6	NWNW	RIM OPERATING, INC	CBM H #11-06	UNA	STO,CBM		
P120270W	11/01/99	43	70	6	NWSW	RIM OPERATING, INC	CBM H #13-06	UNA	STO,CBM		
P120271W	11/01/99	43	70	6	SENW	RIM OPERATING, INC	CBM H #22-06	UNA	STO,CBM		
P120272W	11/01/99	43	70	6	SESW	RIM OPERATING, INC	CBM H #24-06	UNA	STO,CBM		
P120273W	11/01/99	43	70	6	NWNE	RIM OPERATING, INC	CBM H #31-06	UNA	STO,CBM		
P120274W	11/01/99	43	70	6	NWSE	RIM OPERATING, INC	CBM H #33-06	UNA	STO,CBM		
P120275W	11/01/99	43	70	6	SENE	RIM OPERATING, INC	CBM H #42-06	UNA	STO,CBM		
P120276W	11/01/99	43	70	6	SESE	RIM OPERATING, INC	CBM H #44-06	UNA	STO,CBM		
P120277W	11/01/99	43	70	7	NWNW	RIM OPERATING, INC	CBM H #11-07	UNA	STO,CBM		
P120278W	11/01/99	43	70	7	SENW	RIM OPERATING, INC	CBM H #22-07	UNA	STO,CBM		
P120279W	11/01/99	43	70	7	SENE	RIM OPERATING, INC	CBM H #42-07	UNA	STO,CBM		
P12762P	12/30/50	43	71	11	SENW	USDA FOREST SERVICE	STUART #TB 37		STO	4	14
P19250P	12/31/61	44	71	35	SENE	KENNETH & SYLVIA REVLAND	REVLAND #5		STO,DOM	15	12
P19251P	09/30/54	43	71	2	NWSE	KENNETH & SYLVIA REVLAND	REVLAND #1		STO	7.5	14
P19252P	12/31/20	44	71	24	NESW	KENNETH & SYLVIA REVLAND	REVLAND #4		STO	7.5	7
P19253P	12/31/50	43	71	14	SENW	KENNETH & SYLVIA REVLAND	REVLAND #3		STO	7.5	8
P19254P	09/30/54	43	70	7	NWSE	KENNETH & SYLVIA REVLAND	REVLAND #2		STO	7.5	3
P28316W	09/24/74	44	70	7	SWNE	FRANKLIN REALTY	X-2		MIS	0	16
P28317W	09/24/74	44	70	7	SWNE	FRANKLIN REALTY	X-2 (02)		MIS	0	17
P28318W	09/24/74	44	70	7	NWNW	FRANKLIN REALTY	X-4		MIS	0	27
P28319W	09/24/74	44	70	7	NWNW	FRANKLIN REALTY	X-4 (02)		MIS	0	27
P28600W	12/03/74	43	70	11	NWNW	JACOBS LAND & LIVESTOCK CO	JACOBS 11 2	CAN	STO		
P28606P	12/03/74	43	70	3	NWSW	JACOBS LAND & LIVESTOCK CO	JACOBS 3 1		STO	5	22
P28607P	12/03/74	43	70	2	NENE	JACOBS LAND & LIVESTOCK CO	JACOBS 2 1		STO	8	25
P28609P	12/03/74	43	70	14	NWNE	JACOBS LAND & LIVESTOCK CO	JACOBS 14 1		STO	2	8
P28610P	12/03/74	43	70	11	NESE	JACOBS LAND & LIVESTOCK CO	JACOBS 11 1		STO	10	4
P28611P	12/03/74	44	70	29	SENE	JACOBS LAND & LIVESTOCK CO	JACOBS 29 1		STO,DOM	5	29
P28612P	12/03/74	44	70	28	NWNE	JACOBS LAND & LIVESTOCK CO	JACOBS 28 1		STO	10	26
P28613P	12/03/74	44	70	28	SWSW	JACOBS LAND & LIVESTOCK CO	JACOBS 28 2		STO	10	26
P28614P	12/03/74	44	70	26	NWNW	JACOBS LAND & LIVESTOCK CO	JACOBS 26 1		STO	8	6
P28615P	12/03/74	44	70	34	NWNW	JACOBS LAND & LIVESTOCK CO	JACOBS 34 1		STO	5	26
P28616P	12/03/74	44	70	33	NESW	JACOBS LAND & LIVESTOCK CO	JACOBS 33 1		STO	15	11
P28617P	12/03/74	44	70	32	SESE	JACOBS LAND & LIVESTOCK CO	JACOBS 32 1		STO	10	27
P28618P	12/03/74	44	70	35	NWNE	JACOBS LAND & LIVESTOCK CO	JACOBS 35 2		STO	25	30
P28619P	12/03/74	44	70	35	NWNE	JACOBS LAND & LIVESTOCK CO	JACOBS 35 1		STO	20	28
P2966P	06/21/55	44	71	11	NENW	MILLS LAND & LIVESTOCK CO., INC	MILLS #15		STO	4	6
P2967P	12/21/41	44	71	11	NWNE	MILLS LAND & LIVESTOCK CO., INC	MILLS #16		STO	5	9
P2968P	12/21/42	44	71	12	SENW	MILLS LAND & LIVESTOCK CO., INC	MILLS #17		STO	5	18
P2969P	04/12/62	44	71	11	NWSE	MILLS LAND & LIVESTOCK CO., INC	MILLS #18		STO	6	23
P2970P	12/21/39	44	71	13	NESW	MILLS LAND & LIVESTOCK CO., INC	MILLS #19		STO	5	19

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Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P2971P	12/21/38	44	71	23	NWNE	MILLS LAND & LIVESTOCK CO., INC	MILLS #20		STO	6	9
P2972P	09/03/63	44	71	23	SWNE	MILLS LAND & LIVESTOCK CO., INC	MILLS #21		STO	5	42
P2972P	09/03/63	44	71	23	SENW	MILLS LAND & LIVESTOCK CO., INC	MILLS #21		STO	5	42
P2972P	09/03/63	44	71	23	NESW	MILLS LAND & LIVESTOCK CO., INC	MILLS #21		STO	5	42
P2972P	09/03/63	44	71	23	NWSE	MILLS LAND & LIVESTOCK CO., INC	MILLS #21		STO	5	42
P2973P	12/31/46	44	71	25	SENE	MILLS LAND & LIVESTOCK CO., INC	MILLS #22		STO	4	9
P2974P	06/21/35	44	70	30	SWNE	MILLS LAND & LIVESTOCK CO., INC	MILLS #23		STO	5	6
P2974P	06/21/35	44	70	30	SENW	MILLS LAND & LIVESTOCK CO., INC	MILLS #23		STO	5	6
P2974P	06/21/35	44	70	30	NESW	MILLS LAND & LIVESTOCK CO., INC	MILLS #23		STO	5	6
P2974P	06/21/35	44	70	30	NWSE	MILLS LAND & LIVESTOCK CO., INC	MILLS #23		STO	5	6
P2975P	12/21/34	44	70	31	SWNW	MILLS LAND & LIVESTOCK CO., INC	MILLS #24		STO	5	6
P2976P	06/11/61	43	70	6	SWNE	MILLS LAND & LIVESTOCK CO., INC	MILLS #25		STO	5	26
P2976P	06/11/61	43	70	6	SENW	MILLS LAND & LIVESTOCK CO., INC	MILLS #25		STO	5	26
P2976P	06/11/61	43	70	6	NESW	MILLS LAND & LIVESTOCK CO., INC	MILLS #25		STO	5	26
P2976P	06/11/61	43	70	6	NWSE	MILLS LAND & LIVESTOCK CO., INC	MILLS #25		STO	5	26
P30419W	07/16/75	44	71	35	NENE	KENNETH C. REVLAND	REVLAND #1		STO,DOM	25	30
P3050W	09/15/69	43	71	3	SWSE	INC. STUART BROTHERS	STUART #10		STO	5	14
P31780W	01/07/76	43	70	7	SWNW	RENO LIVESTOCK CORPORATION	RENO #1		STO	25	11
P31781W	01/07/76	43	70	7	SENW	WYO STATE HIGHWAY DEPARTMENT	RENO #2	ABA	IND,MIS	-1	26
P3214P	08/24/28	44	71	22	SESE	FERIBA F. FERGUSON	FERGUSON #1		STO,DOM	10	5
P3215P	07/16/30	44	71	27	SENE	W. L. FERGUSON	FERGUSON #1		DOM	10	2
P3216P	10/17/48	44	71	27	SENE	W. L. FERGUSON	FERGUSON #2		STO,DOM	10	10
P33051W	05/03/76	44	71	21	SWSE	EARL A. BOLLER	BOLLER #2	CAN	STO,DOM		
P3343W	10/06/69	43	71	4	SWNE	STUART BROTHERS INC	STUART #8		STO	5	27
P34482W	08/12/76	43	70	15	NWSW	WYOMING W.R.R.I.	LTB-5A		MON,MIS	0	1
P34483W	08/12/76	43	70	17	NWNE	WYOMING W.R.R.I.	LTB-15A		MON,MIS	0	3
P34486W	08/12/76	43	70	15	NWSW	WYOMING W.R.R.I.	LTB-5B		MON,MIS	0	1
P34487W	08/12/76	43	70	17	NWNE	WYOMING W.R.R.I.	LTB-15B		MON,MIS	0	3
P34490W	08/12/76	43	70	15	NWSW	WYOMING W.R.R.I.	LTB-5C		MON,MIS	0	2
P34491W	08/12/76	43	70	17	NWNE	WYOMING W.R.R.I.	LTB-15C		MON,MIS	0	6
P34493W	08/12/76	43	70	16	NESE	WYOMING W.R.R.I.	LTB-5D	UNA	MON,MIS	0	1
P34495W	08/12/76	43	70	16	NESE	WYOMING W.R.R.I.	LTB-5E		MON,MIS	0	1
P39104W	07/15/77	43	70	8	NESE	STUART BROTHERS CONSOLIDATION COAL	CONSOL #1		STO	5	29
P40409W	09/02/77	43	70	11	NWNW	JACOBS LAND & LIVESTOCK COMPANY	11 3	CAN	STO		
P4046W	12/18/69	44	71	26	NWSW	AXEL R. OSTLUND**F. F. FERGUSON	OSTLUND #1	CAN	MIS	125	21
P4071W	12/31/69	44	70	35	NWNE	JACOBS LAND & LIVESTOCK CO. INC	JACOBS 3A	CAN	STO,MIS	60	32
P45855W	10/11/78	43	71	10	SWNE	USDA FOREST SERVICE	MARG #13		STO	3	38
P46040W	12/04/78	44	71	15	SESW	AMOCO PRODUCTION COMPANY	ROCKY HILLS FEDERAL #1	CAN	MIS	100	50
P4767W	03/04/70	43	70	2	NWNW	DALE MILLS MCCUTCHIN DRILLING CO., INC JACOBS LAND & LIVESTOCK	J M #1	CAN	STO,MIS		
P47819W	04/18/79	44	70	18	NESW	ASSOC. OF INDEPENDENT CONSULTANTS	ESSP1	CAN	MON,MIS		

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GROUNDWATER RIGHTS

Permit No.	Priority	Twn	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Yld Act	T.D.
P48534W	05/29/79	43	71	2	SWSW	BURLINGTON NORTHERN INC	MARY ANN #1	CAN	MIS		
P49662W	08/17/79	44	71	16	SENW	WY BOARD OF LAND COMMISSIONERS	RJH-P-2-R		MON MIS	0	75
P5223W	03/09/70	43	70	10	NENE	ANNA RUTH MCKINZIE	ANNA #1	CAN	STO IND MIS		
P5224W	04/06/70	44	70	17	SENW	OSTLUND INVESTMENTS	CONRAD #1-17		STO DOM	25	62
P52336W	05/06/80	43	70	1	NWNE	W R R I	OBS #1		MON MIS	0	10
P52337W	05/06/80	43	70	1	NESE	W R R I	OBS #2		MON MIS	0	8
P54181W	09/23/80	44	69	31	NWSW	WYOMING W R R I	OBS #3	CAN	MON MIS		
P54182W	09/23/80	44	69	31	NWSW	WYOMING W R R I	OBS #4	CAN	MON MIS		
P54183W	09/23/80	44	69	31	NWSW	WYOMING W R R I	OBS #6	CAN	MON MIS		
P54184W	10/15/80	44	69	32	SWSW	WYOMING W R R I	OBS #5	CAN	MON MIS		
P54646W	11/20/80	44	71	16	NESE	WY BOARD OF LAND COMMISSIONERS REARL BOLLER	JUMPOFF #1		MON STO MIS	5	32
P54820W	11/21/80	43	69	6	NWNE	WYOMING W R R I	OBS #7	CAN	MON MIS		
P54821W	11/21/80	44	70	36	NESW	WYOMING W R R I	OBS WELL #8	CAN	MON MIS		
P5862P	08/31/68	43	71	13	NESW	RENO LIVESTOCK CORPORATION	HEARTSPEAR 8		STO	2	32
P5863P	04/30/69	43	70	17	NESE	ATLANTIC RICHFIELD COMPANY	HEARTSPEAR 9	CAN	STO	1.5	27
P5866W	06/22/70	43	71	12	SWNE	DALE MILLS RENO LIVESTOCK CORPORATION	HEARTSPEAR 12	ADJ	STO	25	21
P5867W	06/22/70	43	70	7	NWNE	RENO LIVESTOCK CORPORATION	HEARTSPEAR 15	ABA	STO	25	21
P5869W	06/22/70	43	70	6	NESE	RENO LIVESTOCK CORPORATION	HEARTSPEAR 19	CAN	STO IND MIS		
P59111W	12/29/81	44	70	29	SENE	JACOBS LAND & LIVESTOCK	JACOBS #1		STO DOM	7	62
P5971W	05/29/70	44	71	34	NESE	INC STUART BROTHERS	SWP #1		STO	25	28
P5972W	05/29/70	44	71	34	NESE	INC STUART BROTHERS	SWP #2		STO	25	29
P5973W	05/29/70	43	70	17	SWNW	INC STUART BROTHERS	SWP #3	CAN	STO	25	29
P6348W	08/17/70	44	71	18	SWNW	CARL J SPRINGEN	SPRINGEN #1		STO	14	10
P67545W	06/07/84	43	70	8	NENE	USA USDA FOREST SERVICE	JACOBS #T.B. 204		STO	4	35
P68198W	08/14/84	43	70	18	NWNE	KERR-MCGEE COAL CORP	JLL-14-1		STO	8	34
P779W	08/14/61	43	70	11	NESE	JACOBS LAND & LIVESTOCK CO	SHROYER #1		IRR	350	8
P81595W	01/08/90	43	70	7	SWSW	JACOBS LAND AND LIVESTOCK	#1 SOUTH CONSOL	UNA	STO	10	10
P89324W	09/01/92	44	70	32	SESE	JACOBS LAND AND LIVESTOCK	REYNOLD'S #1	UNA	STO	7	30
P8961P	07/31/64	43	70	5	NWSW	USDA FOREST SERVICE	JACOBS #T.B.#5		STO	4	26
P92345W	07/20/93	44	71	34	SWSE	JAMES R. AND IRENE STUART	ALICE #1	UNA	DOM	8	63
P9681W	07/13/71	43	71	1	NENE	BELLE FOURCHE PIPELINE CO GLADYS KINGTON NORWOOD	SOUTH HEIGHT #1		STO DOM	30	30

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SURFACE WATER RIGHTS

Permit No.	Priority	Tns	Rng	Sec	qq	Applicant	Facility Name	Status	Uses	Source
P462S	10/28/1953	43	70	4	NWNW	J. A. JACOBS	CARTER	PUO	STO	CARTER DRAW
CR2/456A	07/30/1938	43	70	8	NENE	USDA FOREST SERVICE	THUNDER BASIN #105 RES	ADJ	STO	SHIPLEY CREEK
P13319D	06/30/1915	44	70	26	NWNW	O. E. ANDERSON	ANDERSON DITCH #1	EXP	IRR,DOM	SAGE CREEK
P13319D	06/30/1915	44	70	26	SWNW	O. E. ANDERSON	ANDERSON DITCH #1	EXP	IRR,DOM	SAGE CREEK
P13319D	06/30/1915	44	70	26	SENW	O. E. ANDERSON	ANDERSON DITCH #1	EXP	IRR,DOM	SAGE CREEK
P13320D	06/30/1915	44	70	26	SENW	O. E. ANDERSON	ANDERSON DITCH #2	EXP	IRR	SAGE CREEK
P13321D	08/19/1915	44	70	26	SENW	O. E. ANDERSON	ANDERSON DITCH #2	PUD	IRR	DIAMOND LAKE CREEK
P13321D	08/19/1915	44	70	26	SENW	O. E. ANDERSON	ANDERSON DITCH #2	EXP	IRR	DIAMOND LAKE CREEK
P12398D	05/06/1914	44	70	26	NESW	ELLWOOD ANDERSON	ANDERSON DITCH	PUD	STO,IRR,DOM	NAMING ERRORS
P13319D	06/30/1915	44	70	26	NESW	O. E. ANDERSON	ANDERSON DITCH #1	EXP	IRR,DOM	SAGE CREEK
P13319D	06/30/1915	44	70	26	NESW	O. E. ANDERSON	ANDERSON DITCH #1	PUD	IRR,DOM	SAGE CREEK
P13320D	06/30/1915	44	70	26	NESW	O. E. ANDERSON	ANDERSON DITCH #2	PUD	IRR	SAGE CREEK
P2648R	05/06/1914	44	70	26	NESW	ELLWOOD ANDERSON	ANDERSON	PUO	STO,IRR,DOM	SAGE CREEK
P13319D	06/30/1915	44	70	26	NWSW	O. E. ANDERSON	ANDERSON DITCH #1	EXP	IRR,DOM	SAGE CREEK
P4086S	01/31/1962	44	70	29	SWSW	J.A. JACOBS	CORNER	PUO	STO	MILLS #2 DRAW
P414S	10/07/1953	44	70	30	SWNE	RALPH E. MILLS	MILLS #1	PUO	STO	MILLS #1 DRAW
P415S	10/07/1953	44	70	30	SESE	RALPH E. MILLS	MILLS #2	PUO	STO	MILLS #2 DRAW
P416S	10/07/1953	44	70	31	SWNE	RALPH E. MILLS	JOHNSON #1	PUO	STO	MILLS #1 DRAW
P417S	10/07/1953	44	70	31	NESE	RALPH E. MILLS	LONE TREE	PUO	STO	MILLS #1 DRAW
P418S	10/07/1953	44	70	31	SWSE	RALPH E. MILLS	CROOKED	PUO	STO	MILLS #1 DRAW

Abbreviation Key from the Wyoming State Engineer's Water Right Database
Abbreviations for uses: DEW=Dewatering, DOM=Domestic, DSP=Domestic Supply, FIS=Fish Propagation, FLO=Flood Control, IND=Industrial, IRR=Irrigation, MAN=Manufacturing, MIN=Mining, MIS=Miscellaneous, MON=Monitoring, MUN=Municipal, POW=Power Development, REC=Recreation, RES=Reservoir Supply, STO=Stock, TEM=Temporary Use (normally construction of roads or oil well drilling), UTI=Utility, WET=Wetlands, WIL=Wildlife, CBM=Coal Bed Methane

Abbreviations for status: ABA=Abandoned, ADJ=Adjudicated, CAN=Canceled, EXP=Expired, GST=Good standing pending reciept of legally required notices, PU=Point of outlet for a reservoir, PUD=Point of diversion for a ditch or pipeline, PUO=Point of outlet for a reservoir, UNA=Unadjudicated

Record Suffixes are denoted as follows: "A" indicates adjudicated or finalized water rights and unless the right is a territorial appropriation, there will be match in the reference column from one of the following permit types for the unadjudicated portion of the water right. "C" permits are well statements of claim, filed from 1947 to 1957 for wells completed prior to April 1, 1947. "G" permits are well registrations, filed for wells completed after April 1, 1947. "P" permits are for stock and domestic use wells completed prior to May 24, 1969 and registered with the State Engineer's Office prior to December 31, 1972. "W" permits are for wells with a priority date for the date of filing with the State Engineer. "D" signifies a ditch or pipeline permit. "E" signifies an enlargement of a ditch or pipeline permit. "S" signifies a stock reservoir permit. "R" signifies a reservoir permit.

APPENDIX F

PROTECTION OF THREATENED AND ENDANGERED SPECIES

Introduction

The Endangered Species Act (16 U.S.C. 1531-1543) protects plant and animal species that are listed as T&E as well as their critical habitats. Endangered species are defined as those that are in danger of extinction throughout all or a significant portion of their range. Threatened species are those that are likely to become endangered in the foreseeable future throughout all or a significant portion of their range. Candidate species include species for which the USFWS has sufficient data to list as T&E but for which listing is precluded by a higher priority action.

In a letter dated October 25, 1999 and in comments dated October 3, 2000, the USFWS advised the BLM that the following threatened, endangered, proposed or candidate species may be present in the area of the North Jacobs Ranch federal coal lease application:

Black-footed ferret (endangered)
Bald eagle (threatened)
Mountain plover (proposed)
Ute Ladies'-tresses (threatened)
Swift fox (candidate)
Sturgeon chub (candidate)
Black-tailed prairie dogs (candidate)

In response to a March 3, 2000 request from Intermountain Resources to provide a listing of T&E species likely to occur on or adjacent to the North Jacobs Ranch LBA Tract, the USFWS identified the black-footed ferret, bald eagle, mountain plover, swift fox, and black-tailed prairie dog as potentially being present in the area in a letter dated March 16, 2000.

Description of the Proposed Project

The North Jacobs Ranch coal lease application is for federal coal reserves located north of and adjacent to the Jacobs Ranch Mine in Campbell County, Wyoming. The application area is located in southern Campbell County, Wyoming, approximately 7 miles east of Wright, Wyoming. The tract as applied for includes approximately 4,820 acres.

Under the Proposed Action, the federal coal in the North Jacobs Ranch LBA Tract, as applied for by JRCC, would be offered for lease at a competitive sale, subject to standard and special lease stipulations developed for the Wyoming PRB. These stipulations are listed in Appendix D of this EIS. The Proposed Action assumes that the tract would be developed as a maintenance lease to extend the life of an adjacent existing surface coal mine. As a result, there would not be major changes in facilities, roads or employment. The project area is shown in Figures 1-1 and 1-2 of this EIS and additional information about the proposed project is provided in Section 2.1.

Under Alternative 1, the No Action Alternative, the application to lease the federal coal in the North Jacobs Ranch LBA Tract would be rejected and the tract would not be leased at this time. Selection of Alternative 1 would not affect already approved mining activities at the adjacent mines and other mines in this area. This alternative is discussed in Section 2.2 of this EIS, and the adjacent mines are shown in Figure 1-1.

Alternatives 2 and 3 are also analyzed in detail in this EIS. In evaluating this lease application, BLM identified alternative tract configurations designed to minimize the risk of bypassing federal coal that would then potentially become economically unrecoverable or reduce potential conflicts with existing and proposed oil and gas development on the tract. Alternative 2 considers adding additional coal east of the LBA Tract as applied for to avoid future bypassing of that coal. Alternative 3 considers decreasing the size of the tract to reduce potential conflicts with proposed and existing oil and gas development. The coal added under Alternative 2 would also be added to the tract in Alternative 3. Alternatives 2 and 3 are shown in Figure 2-1 and discussed in Sections 2.3 and 2.4, respectively, of this EIS.

Land Use Planning Screening Analysis

The North Jacobs Ranch LBA Tract is included in the area that has been evaluated for acceptability for further lease consideration as part of the coal screening process. The coal screening process is a four part process which includes application of the coal unsuitability criteria for the BLM Buffalo Resource Management Plan. The coal unsuitability criteria, which are defined in 43 CFR 3461.5, are listed in Appendix B. Unsuitability criterion 9 pertains to federally designated or proposed critical habitat for listed, threatened or endangered plant and animal species, Criterion 11 pertains to active bald or golden eagle nests or sites, Criterion 12 pertains to bald and golden eagle roost and concentration areas, and criterion 14 pertains to high priority habitat for migratory birds of high federal interest (which includes the mountain plover).

The unsuitability criteria were applied to the area of high and moderate coal potential in the Wyoming PRB by the BLM and the USFS in 1984, as part of the RMP for the BLM Buffalo Resource Area, and the LRMP for the Medicine Bow National Forest and the Thunder Basin National Grassland. The unsuitability criteria were re-evaluated in 1992 and 1993 by the BLM and USFS, and a report of the findings of that screening was prepared in 1997.

In the case of the North Jacobs Ranch coal lease application area, there were no unsuitable findings under any of the criteria pertaining to T&E species in either the 1984 or 1992-1993 screening.

As part of the leasing process, all of the coal unsuitability criteria are reviewed site-specifically for each individual lease application based on the most current survey information. The unsuitability findings have been reviewed specifically for the North Jacobs Ranch LBA Tract, and the findings are summarized in Appendix B of this EIS. The findings pertaining to T&E species are based on currently available T&E surveys of the North Jacobs Ranch LBA Tract. These surveys are identified and summarized in the following discussions. Based on the site specific review of the currently available surveys, there are no unsuitable findings in the case of the North Jacobs Ranch coal lease application area under any criteria pertaining to T&E species.

Regulatory Requirements and Mitigation

The issuance of a Federal coal lease grants the lessee the exclusive rights to mine the coal, subject to the terms and conditions of the lease. Lease ownership is necessary for mining federal coal, but lease ownership does not authorize mining operations. No operations can occur on the leased lands until the approval of both the MLA mining plan and the state mining and reclamation permit under the applicable Wyoming state regulations (see Section 1.2: Regulatory Authority and Responsibility).

If the North Jacobs Ranch LBA Tract is leased, the lessee may be required to conduct additional surveys and other evaluations as part of the permit application and approval processes to ensure compliance with the Endangered Species Act. It will be important to confirm the potential, or lack of potential, for impacts to any threatened, endangered, candidate or other special status plant/animal species prior to beginning proposed surface disturbing activities. Coordination with the USFWS during the permit application review process should resolve any potential impacts that are confirmed. If the impacts cannot be satisfactorily resolved, the State regulatory authority would condition any resulting permit to mine coal with species-specific protective measures. The permit application and approval process would be based on the most current survey information and an actual detailed site-specific mining and reclamation proposal.

To inform/remind the lessee of the potential for additional survey and evaluation activity prior to mining, BLM will attach the following stipulation to the lease:

> ***Threatened, Endangered, Candidate, or Other Special Status Plant and Animal Species.*** *The lease area may contain habitat for the following threatened, endangered, candidate, or other special status plant and animal species: black-footed ferret, bald eagle, mountain plover, Ute Ladies'-tresses, swift fox, sturgeon chub, and black-tailed prairie dog. If surveys performed during the permit application process or future permit revisions indicate that any threatened, endangered, candidate, or other special status plant/animal species could be impacted by proposed coal mining and reclamation operations located on this lease and the potential impacts to that species cannot be satisfactorily resolved through coordination with the USFWS, the proposed coal mining and reclamation operations could be restricted or constrained by the State regulatory authority.*

The following is a partial list of measures that the state of Wyoming could require as part of the mining and reclamation permit in accordance with the state regulatory requirements:

- Avoiding bald eagle disturbance;
- Restoring bald eagle foraging areas disturbed by mining;
- Restoring mountain plover habitat;
- Using raptor safe power lines;
- Surveying for Ute Ladies'-tresses if habitat is present;
- Surveying for mountain plover if habitat is present;
- Surveying for black-footed ferrets if prairie dogs move onto tract.

Ute Ladies'-tresses (Spiranthes diluvialis)

Existing Environment

Ute Ladies'-tresses is a federally-listed threatened member of the orchid family identified by the USFWS as potentially occurring on the LBA Tract. Typical suitable habitat for Ute Ladies'-tresses is found along perennial or ephemeral streams with subirrigation into late July or August. The LBA Tract was investigated for suitable habitat for the Ute Ladies'-tresses orchid by Intermountain Resources in 1999. Ephemeral streams with subirrigation into late July and August do not exist on the North Jacobs Ranch LBA Tract. Other wetlands, which are not considered suitable Ute Ladies'-tresses habitat, do exist on site. These wetlands were surveyed in the field for the orchid in late July and August of 1999. Surveys consisted of inventorying each wetlands site twice, once in July and once in August, for the presence of Ute Ladies'-tresses. No orchids were found during those surveys.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, Ute Ladies'-tresses would not be likely to be directly or indirectly impacted because typical suitable habitat for this species does not exist on the tract. If a lease is issued for the tract, mining operations could not be initiated until the MLA mining plan and the state mining and reclamation permit are approved. If future surveys of the tract do locate this species on the wetlands that are not considered typical suitable habitat for this species prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve any potential conflicts.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the Ute Ladies'-tresses orchid or its habitat.

Bald Eagle (Haliaeetus leucocephalus)

Existing Environment

The bald eagle is a federally-listed threatened species. It is a common winter resident and migrant in the area of the North Jacobs Ranch LBA Tract, and has been observed foraging on the area during past surveys. This species has winter roost sites in the Rochelle Hills, approximately four miles east of the LBA Tract. The North Jacobs Ranch LBA Tract was surveyed for bald eagle roost sites in January and February of 2000 by Intermountain Resources. The site does not contain any suitable roosting habitat. The LBA Tract and lands within one mile do not contain trees large enough to support an eagle nest. There are no concentrated food sources for the eagle on the tract.

Effects of the Proposed Project

If a lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, bald eagle foraging habitat would be lost on the tract during mining and before reclamation. The loss of any potential prey habitat would be short-term. Foraging habitat that is lost during mining would be replaced as reclamation continues on already mined out areas. Through February, 2000, more than sixty percent of the area that has been disturbed by coal mining activities at the existing Jacobs Ranch Mine had been reclaimed. Eagles may alter foraging patterns as they fly around areas of active mining activity. Potential for bald eagles to collide with or be electrocuted by electric power lines on the mine site is minimal due to use of raptor safe power lines.

The North Jacobs Ranch LBA Tract does not include any suitable roosting habitat or trees large enough to support an eagle nest. If a lease is issued for the tract, mining operations could not be initiated until the MLA mining plan and the state mining and reclamation permit are approved. If future surveys of the tract identify that the situation has changed and that bald eagle roosting or nesting habitat could be impacted by mining activities on the tract, coordination with the USFWS during the permit application review process should resolve potential conflicts.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the bald eagle or its habitat.

Black-footed Ferret (Mustela nigripes)

Existing Environment

The black-footed ferret is a federally-listed endangered species. Black-footed ferrets are found exclusively living in prairie dog towns, and prairie dogs are the main prey source for the black-footed ferret. The North Jacobs Ranch LBA Tract has been surveyed for prairie dog towns by systematically searching the entire tract and adjacent area during surveys conducted in 1999 and 2000. There are no prairie dog colonies on the LBA Tract, the nearest town is approximately ¼ mile away. No evidence of black-footed ferrets has been found during surveys of prairie dog towns located in the general area of the North Jacobs Ranch LBA Tract. As a result, ferrets would not be expected to occur in the area.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, black-footed ferrets would not be likely to be directly or indirectly impacted because prairie dog towns, the typical suitable habitat for this species, are not currently located on the tract. If a lease is issued for the tract, mining operations could not be initiated until the MLA mining plan and the state mining and reclamation permit are approved. If future surveys of the tract find that prairie dogs have moved onto the tract prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve potential conflicts.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the black-footed ferret or its habitat.

Mountain Plover (Charadrius montanus)

Existing Environment

The mountain plover is proposed for listing as threatened. It breeds in areas of dry short-grass vegetation and may be associated with prairie dog colonies.

The North Jacobs Ranch LBA Tract was surveyed from March through July of 1999 for habitat typically used by mountain plovers by Intermountain Resources. Surveys consisted of mapping all vegetation/ habitat types within the area. No areas with low growing vegetation or sparse vegetation, typical of mountain plover habitat, were found. Prairie dog towns were not found within the tract. Surveys to determine the presence of mountain plovers were conducted in March through July when the species are present in Wyoming. These surveys were completed by traversing the area in a vehicle or on an ATV during the early morning hours after sunrise and during the hours prior to sunset. At least two surveys were completed each month from March through July in 1999. One survey was completed in March, two surveys in April, one survey in May, and one survey in June of 2000. No mountain plovers have been recorded on or near the LBA Tract.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, mountain plovers would not be likely to be directly or indirectly impacted because the typical suitable habitat for this species, short grass prairies and/or prairie dog towns, are not currently located on the tract. If a lease is issued for the tract, mining operations could not be initiated until the MLA mining plan and the state mining and reclamation permit are approved. If future surveys of the tract find that mountain plover habitat exists on the tract prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve potential conflicts.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to jeopardize the mountain plover or its habitat.

Swift Fox (Vulpes velox)

Existing Environment

The swift fox is a candidate species. Specific surveys were not conducted for the swift fox and no foxes were observed during surveys conducted for other species.

The swift fox has never been recorded in the area and is not expected to be found there due to the lack of abundant grassland or short shrub habitats.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, swift foxes would not be likely to be directly or indirectly impacted because the typical suitable habitat for this species is not currently located on the tract and swift foxes have never been recorded in the area. If a lease is issued for the tract, mining operations could not be initiated until the MLA mining plan and the state mining and reclamation permit are approved. If future surveys of the tract find swift fox habitat on the tract prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve future potential conflicts prior to authorization of surface disturbing activities.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the swift fox or its habitat.

Sturgeon Chub (Macrhybopsis gelida)

Existing Environment

Habitat for the sturgeon chub does not exist within the area. This species requires large perennial streams with silty bottoms. This species is found within the Big Horn and Powder River drainages, but the LBA Tract is located within the Cheyenne River drainage.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, the sturgeon chub would not be likely to be directly or indirectly impacted because the typical suitable habitat for this species does not exist on the tract. If a lease is issued for the tract and future surveys identify potential sturgeon chub habitat prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve potential conflicts prior to authorization of surface disturbing activities.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the sturgeon chub or its habitat.

Black-tailed Prairie Dog

Existing Environment

The black-tailed prairie dog is a candidate species. As discussed above, the North Jacobs Ranch LBA Tract has been surveyed for prairie dog towns by systematically searching the entire tract and adjacent area during surveys conducted in 1999 and 2000. There are no prairie dog colonies on the LBA Tract, the nearest town is approximately ¼ mile away.

Effects of the Proposed Project

If a federal coal lease is issued for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3, prairie dogs would not be likely to be directly or indirectly impacted because prairie dog towns are not currently located on the tract. If a lease is issued for the tract and future surveys of the tract find that prairie dog towns have been established on the tract prior to surface disturbing activities, coordination with the USFWS during the permit application review process should resolve any potential conflicts. Habitat where prairie dogs could establish towns would be lost during mining but would be replaced as reclamation occurs on already mined out areas. Through February, 2000, more than sixty percent of the area disturbed by coal mining activities at the existing Jacobs Ranch Mine had been reclaimed.

As a result, issuing a federal coal lease for the North Jacobs Ranch LBA Tract under the Proposed Action or Alternatives 2 or 3 is not likely to adversely affect the black-tailed prairie dog or its habitat.

No Action Alternative (Alternative 1)

Under the No Action Alternative, the North Jacobs Ranch lease application would be rejected and the tract would not be leased at this time. Mining activities at the adjacent mines would be limited to already approved disturbance to remove coal from existing leases. Coal would not be removed from the North Jacobs Ranch LBA Tract, but some mining-related surface disturbance would occur to allow removal of coal from the adjacent existing federal coal leases.

Under Alternative 1, impacts to Ute Ladies'-tresses, mountain plover, swift fox, and sturgeon chub would not be expected to be different than described above for the Proposed Action and Alternatives 2 and 3 because the North Jacobs Ranch LBA Tract does not include any typical suitable habitat for these species. For the bald eagle, selection of Alternative 1 would mean that eagle foraging habitat would not be lost on the LBA Tract during mining and eagle foraging patterns would not be affected by mining activity on the LBA Tract. As indicated above, there is no bald eagle roosting or nesting habitat on the tract at this time. For the prairie dog and black-footed ferret, selection of Alternative 1 would mean that the area of the North Jacobs Ranch LBA Tract would remain an available site for future prairie dogs towns. There are no prairie dog towns currently located on the tract.

Cumulative Effects

Existing activities in the PRB which could impact T&E species include oil and gas development (including coal bed methane), surface coal mining, uranium mining, sand and gravel mining, proposed power plant and railroad line construction, ranching, and recreational activities such as hunting. Mining and construction activities tend to have more intense impacts on fairly localized areas, while ranching, recreational activities, and oil and gas development tend to be less intensive but spread over larger areas. Oil and gas development and mining activities have requirements for reclamation of disturbed areas as resources are depleted. The net area of energy disturbance in the Wyoming PRB is increasing overall, however, as new areas of disturbance are added, mined-out areas are restored and reclaimed and oil and gas well sites are reclaimed when depleted oil and gas wells are abandoned.

Issuing a lease for the North Jacobs Ranch LBA Tract would not be expected to change potential cumulative impacts to T&E species in the PRB. The tract is proposed as a maintenance lease for an existing mine. If it is leased under the Proposed Action or Alternatives 2 or 3, mining activities would gradually move from the existing Jacobs Ranch leases onto the LBA Tract. As the mining activities move off the existing leases, restoration of the land surface and reclamation would occur in the mined-out areas of the existing leases. The habitat on the newly leased area would not be available for use by previously resident species during mining operations, but the newly reclaimed areas on the existing leases would become available for use by wildlife. The existing mining facilities, transportation facilities and workforce would be used to mine the new lease. The mining activities would be extended by 8 to 12 years, depending on which alternative is chosen. The applicant, JRCC, has indicated they plan to increase production to an average of 39 million tons per year (about a 9 million tons per year increase) and increase employment by 18 people to a new total of 368, if they acquire a lease for the North Jacobs Ranch LBA Tract.

References and Personal Contacts

References considered in this Appendix are included in Section 6 of this EIS. Personal contacts consulted in preparation of this Appendix are Jim Orpet and Russel Tait of Intermountain Resources.

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